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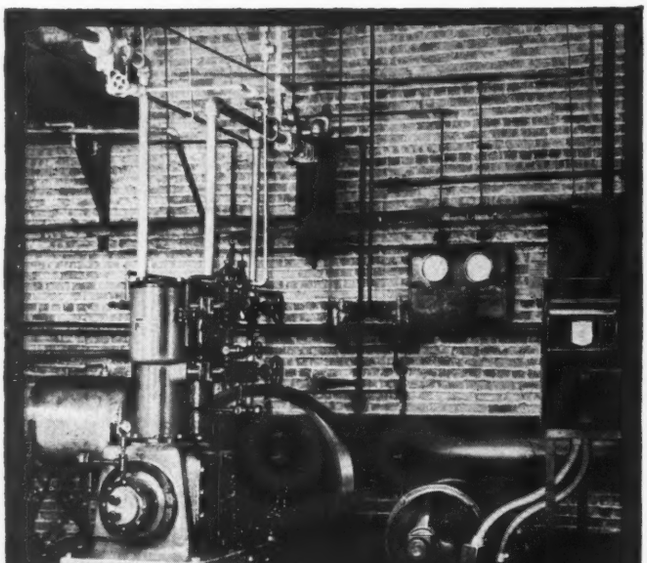

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Vol. 9, No. 10

Laurence V. Burton, Editor

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OCTOBER 1937

The Talk of the Industry

» NORWEGIANS have taken a leaf from the book of experience of American economic royalists who incorporated their yachts to escape some fancy taxes. The Norwegian economic royalist incorporates an American tank ship under some American state law and goes a-whaling. This whale oil, though owned and produced for the benefit of citizens of Norway, is technically American whale oil and competes with American farmers without paying the 3-cent tax. Which, A. M. Loomis, of The National Dairy Union, says has gotta stop.

» TECHNOCRACY, believe it or not, is still going strong. Just in case you are interested in the technocratic view of the future, the following dire prediction is quoted from August *Technocracy Digest:*

"Production is climbing steadily and has practically reached its 1929 peak. The next step is the mighty plunge. It will occur in the not distant future; before 1940 most likely."

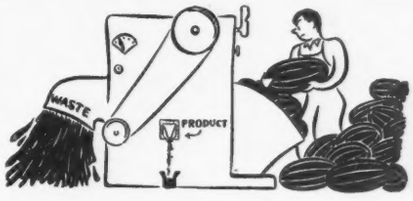
Well, that's quite a long time from the last predicted bust-up which, if we recall it correctly, was to have occurred six months after Jan. 1, 1934.

» COMMON LABORERS averaged slightly more than 40 cents per hour upon entering a job in industry in July, 1936. Those who went into the slaughtering and meat packing industry received 45.5 cents per hour, a figure exceeded only by 46.5 cents per hour in the automobile parts industry. And all this was before the C.I.O. got started. Not bad, in fact, not half bad!

» ACROSS OUR DESK come many odd bits of information, interesting though not particularly vital to food manufacturing—like "The Influence of Colony Populations on Honey Production". (*Jour. Agric. Research,* 54, 945, 1937.) Such a publication shakes our faith in bees, however, for we always believed that the bee embodied all the virtues of tireless energy. Yet here is evidence that bees "let down" on occasion when they are not closely supervised. If 15,000 bees in one colony produce one unit of honey per thousand bees in a given time, then 30,000 bees do better by producing 1.36 units, while a 45,000 bee colony is still better at 1.48 units and 60,000 bees produce at the rate of 1.54 units per thousand. There ought to be a moral here, but we cannot discover it.

» THE MOST PECULIAR INQUIRY that has come to FOOD INDUSTRIES in many months is for published literature on how to produce a cereal preparation from watermelon seed. Unfortunately for the inquirer, our specialist on how to make a cereal from watermelon seed is on a protracted vacation.

Our curiosity has been aroused, however. Where would one obtain watermelon seed by the ton? How much does it cost to harvest watermelons and clean the seeds? Some



of the seed growers around Rocky Ford, Colo., used to allow visitors to eat all the watermelon they could consume on condition that the seeds were deposited in a barrel put there for the purpose, and furthermore, that the free watermelon consumption be done only by daylight!

» IN A GENEROUS MOMENT we recently admitted in writing that we thought that the United Brewers Industrial Foundation was taking a step in the right direction in its effort to have beer take its rightful place with other foods. But, when the Foundation begins to send out publicity on the origin of the Beer Jacket at Princeton University and news about the Beer Jacket's popularity with co-eds and debutantes, it seems to us that the Foundation has its foot on a banana peel.

» MR. WLADIMIR WOYTINSKY, author of a recent study on the cost of the world depression from 1930 to 1934, figures that the world has been set back by $149,000,000,-

000. He calls it "a fateful figure, equal to the cost of the World War."

All of which checks up with our own economic belief that the depression came as a result of the World War. And it suggests that wars cost exactly twice as much as we think they do. Apparently we pay once while the war goes on. Then we pay again about ten or twenty years after it is over. The history of this country tells this story over and over.

Mystery

ONE OF THE GREAT MYSTERIES of industrial life is the explanation of why some concerns get into a jam with the government by selling goods that do not conform to Federal definitions of standards and identity. (You see we have just been reading some F.T.C. Cease and Desist Orders.) We have tried repeatedly to get such concerns to tell us whether they didn't know there was such a standard, or whether they knew but decided to take a chance.

Although all our pious inquiries after knowledge have been rebuffed (Holy Writ to the contrary, notwithstanding) we opine that most of such cases arise from instances where management doesn't know its stuff and depends on so-called cooks for technical guidance.

Some managers are queer birds. They will squeak like a stuck hog over paying a consulting chemist $100 for advice which will keep them out of trouble, but will pay $500 to a lawyer without a murmur after they are in trouble. There are much cheaper ways of getting an education on food standards than by trips to Washington with lawyers.

Hors d'Oeuvres

• The dairy industry is proud of the fact that milk contains 101 different substances, and that no chemist, try as he will, can mix those substances together and produce milk. But after all, it's nothing a cow can't do.

• *The war in Spain has completely destroyed the paprika industry there, the American supply now coming entirely from Hungary. But Spain should worry. Conditions in the World being what they are, somebody probably will start laying explosive eggs on Hungary some of these years. Then Spain will get the paprika market back.*

• A headline in the daily financial page tells us that "Canned Foods are Generally Quiet." Then that was rats we heard in the pantry.

• *Scientific reports before American Chemical Society indicate that food and TNT can be produced from crude oil. Which, it seems, gives us a good supply of the two prime needs of modern civilizations.*

• Rhode Island recently conceived the cute trick of putting red vegetable dye into milk brought into the state from Vermont, and everything was lovely for the Rhode Island milk producers until a Federal judge issued a restraining order. The judge probably felt the Vermont cows were just as contented as those in Rhode Island and that the red color was unjustified.

• *Biscuit makers recently went on strike at the Battle Creek plant of Weston Biscuit Co. They wanted more dough.*

• Who says milk is babies' food? History lists among milk drinkers the fierce horsemen of Genghis Khan, who swept Asia with their hoofbeats and pushed back the barriers of middle Europe. So let's have another cup of coffee.

• *A poker hand appears on the reverse side of the label on Pfieffer's bottled beer. This provides a sporting and amusing means of determining who buys the drinks when the boys are having one together on the way home. But isn't more beer consumed and more songs sung when everyone buys a round?*

• At the height of its yield in 1913, the sockeye-salmon industry of the Fraser River produced nearly 11 million dollars for American packers. Last year, it produced little more than $800,000, though the price per unit had doubled. The sockeye industry has been practically kayoed.

• *The master marketing minds of the Wisconsin cheese industry are suggesting the use of Limburger for picnic sandwiches. Which isn't such a bad idea. It ought to keep the ants away.*

• Every now and then we like to whet your appetite with the delectables enjoyed by connoisseurs in distant places. So here goes: Dried dragon-flies are fried in oil with onions and preserved shrimp by natives of the Malay Archipelago. The black natives of Narrinjeri, Africa, eat the larvae of a fly found under the bark of trees. West Indies natives consume the larvae of the stag beetle, while in Chile and Peru, chupe de chiche, a stew made of potatoes and beetle-like insects is said to be a national dish.

"Unholy Alliance"

THE PRESIDENT has characterized as an "unholy alliance" the joint effort of cane and beet growers on the one hand and seaboard refiners on the other to secure protection of the domestic sugar business. The language used represents as ungraceful, unbecoming vituperation as ever has characterized one who never is restrained, either by facts or respect for his own office, in his charges against those who oppose him. It is "unholy" to combine with anyone in opposition to the President. It is "immoral" to use one's legal rights to minimize tax burdens. It is in all respects unvirtuous to be anything but a supporter of the President's methods.

The food industries of America might as well make up their mind that as long as they are either aggressive or successful they will be subject to such attacks. They might as well plan to continue those measures of self-defense and service to the public which they believe to be legal, honest, decent, and appropriate for their self-respect. They cannot reply to the President in appropriate language. They can simply ignore him in his intemperate invective.

But the public is entitled to certain facts. In the cost of sugar at the housewife's kitchen there is a small charge for refining, which includes a very narrow margin of reward to the refiner for his investment and his service. No one denies this. But it is equally true that the President's method of taking from those who have, to give to those who have not, places on every pound of sugar a money burden that is at least four to six times as great as the refiners' total charge, including manufacturing costs. The housewife, for whom the President weeps, should be told these facts in no uncertain language. The American housewife is nobody's fool. She will shortly decide who is unholy.

Legislation of 1938

THE MANY ITEMS of legislation pending when Congress adjourned in August remain in *status quo* until the legislators return to Washington. Those items on which the President or certain industrial groups did not secure prompt action have not died. They merely repose while their backers recuperate and gather strength (and votes) for final enactment in the next session of this same Congress.

Food executives can expect that a number of outstanding reform and control measures will be enacted within the next six to nine months. Agricultural control legislation is promised by the Administration as the first item to receive attention. Wage and hour standards for the benefit of labor will be fixed. The prevention of stream pollution will be undertaken. Further judicial reform will be attempted.

Above all, it is to be expected that the President will undertake to gather more and more authority in Washington, and that Washington authority will concentrate more and more in the hands of the Chief Executive. How much of this effort will be approved by Congress depends on what members hear back home during this interval between sessions. If the American public is tired of reform and Washington bossing, Congress will be reluctant to pass more such legislation. If the popularity of the President remains undiminished, which Washington doubts, then the program of the New Deal will be advanced.

It is highly important that the real sentiment of industry and of the individual voters be made clear to the members of Congress before they return to Washington again. It is not only important, it is right, that these legislators should go back and cast votes in accordance with the honest wishes and beliefs of their constituents. The New Deal will be working valiantly to make its wishes appear as the desires of the public. Those who have other opinion must make that opinion clear and persuasive in order to have it considered appropriately.

Bread in the Icebox

AT LAST, some small bakers are encouraging their customers to keep bread in the icebox during the warm summer months. Why? It delays staling and the development of mold.

Such recommendations are good, as far as they go. We have personal knowledge that it helps, but ordinary refrigerator temperatures will not permanently prevent either staling or molding; they merely slow them down. And, unless care is taken to avoid it, the dehydrating action of mechanical refrigerators is likely to result in more rapid staling of the bread. In the mechanical refrigerator, the bread should be kept well wrapped or in tightly closed containers such as the so-called vegetable "hydrator." In any case, ordinary refrigerator temperatures help to prolong the good eating qualities of bread for only a relatively short time over ordinary room temperatures.

In no case is the average refrigerator temperature to be regarded as a substitute for mold control work in the bakery or for the use of ingredients and bake-shop practices which will make bread stay fresh a normal length of time.

The foregoing comments are not to be confused with the effect of freezing temperatures in which experimental studies have shown that frozen bread will keep its good eating qualities longer than bread kept at room temperature. Also, Europeans, particularly the Dutch, are making commercial use of freezing temperatures in the distribution of bread. Perhaps freezing is a means of avoiding staling, but ordinary icebox temperatures around 50 to 60 deg. are not.

Absorbing Vitamins Through the Skin

ONE MORE SCIENTIFIC PERIODICAL has made its initial appearance recently: *Studies of The Institutum Divi Thomae,* graduate school of scientific research of The Athenaeum of Ohio. None other than our old friend George S. Sperti is director.

Despite its Latin name, the publication is in English, and Vol. 1, No. 1 indicates that considerable attention is being paid to vitamins at *The Institutum Divi Thomae.* One study indicates that vitamin D seems to be absorbed through the skin about as well as from the digestive tract. Another study shows that vitamin A is also easily absorbed through the skin.

It looks like there might develop a new form of competition for those manufacturers who like to stress vitamin content of their foods in their sales promotion.

Opportunity

JUDGING by the recent Notice of Judgment under the Food and Drug Act, some smart young chemists ought to be able to make a little money by setting up spray removal plants for the removal of spray residues from apples and other fruits at important shipping points. Or better yet, the farm organization or shippers themselves should arrange to hire competent men to supervise toxic spray removal from fruit in their packing plant, thus shouldering their own responsibility.

Slum Clearance Increased Deaths

NOW THAT THE WAGNER HOUSING LAW has been signed, results following similar legislation in Great Britain become of interest. Some unexpected results, that have a direct interest for the food industries, have arisen out of slum clearance there. Our British contemporary, *Food Manufacture,* has pointed out that when people were moved out of the slums to a new housing project at Stockton-on-Tees, in England, their death rate went up in five years from 22.91 to 33.55 per thousand! In direct contrast to this amazing increase, the death rate in nearby slum areas actually went down in the same period.

The cause of this 50-per cent increase in mortality of the poor was brought about by increased rentals charged in the improved area, leaving a smaller amount of their meager resources available for the purchase of food. This startling conclusion originated with the health officers who made the investigation.

A 50-per cent increase in number of deaths seems to be a pretty high price to exact from the unfortunates if, as appears to be the case, this form of social progress deprives them of enough to eat of the right foods. To be sure the slums of any city are unpleasant, but so is untimely death.

From this one experience it is evident that social progress must be integrated with other factors and must not be haphazard. Adequate nutritional needs must be geared to whatever population shifts may be imposed. To increase greatly the probability of earlier death of a large mass of the population, just because those in power do not approve of their mode of residence is not our idea of liberalism—nor is it true progress except possibly to short-sighted ruthless reformers.

Furthermore, if it means fewer consumers and smaller food budgets in congested areas, it offers a problem of marketing to food manufacturers who supply their needs.

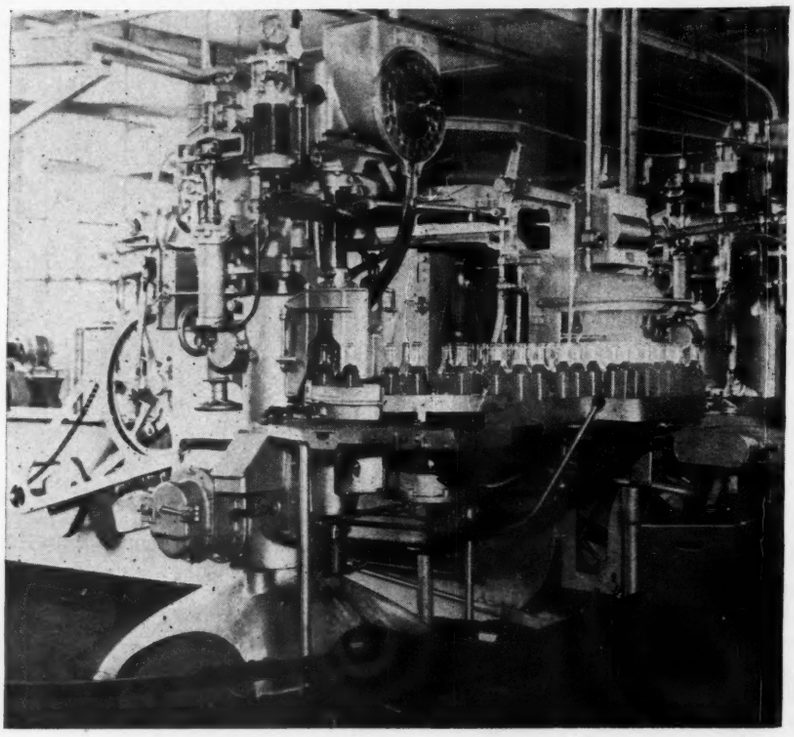
Slums ought not to exist and, though people—not buildings—make slums, the proper corrective for the inadequacy of these people is hardly to be considered as synonymous with extermination, even via a more genteel mode of existence.

Applying SCIENTIFIC CONTROL To Beverage Bottling

How problems of carbonation, water treatment, syrup preparation and bottle cleaning are handled.

By MAX LEVINE

Department of Bacteriology and American Bottlers of Carbonated Beverages Fellowship Iowa State College, Ames, Iowa.



THE PROBLEMS OF SCIENTIFIC CONTROL may perhaps be most readily appreciated from a consideration of the nature and characteristics of carbonated beverages and the fact that the industry comprises numerous small plants which are not in a position to employ trained technical men.

Carbonated beverages are compounded from flavored sugar syrups, fruit or other edible acids, mixed with properly carbonated water and packaged in clean, attractive, glass containers. The flavors and acids generally present no serious problems because these constituents are carefully standardized before reaching the bottling plant, and, except for the true fruit concentrates, are not likely to be a source of beverage spoilage.

Carbonation, water treatment, syrup preparation, and bottle cleaning are the paramount problems of the bottled beverage industry, and these items will be briefly considered with respect to a few control procedures which have been developed.

In the older methods of carbonation, which are still employed in the smaller plants, the water, without precooling, is carbonated under high pressure and placed in bottles which must be closed almost instantaneously in order to prevent loss of the gas. This procedure results in the incorporation of relatively large quantities of air. This is undesirable both from the standpoint of keeping qualities and retention of the carbon dioxide gas when the beverage is served. The newer and by far the better practice takes advantage of the considerably greater solubility of carbon dioxide gas in water at low temperatures. The water is refrigerated before carbonation, which can now be accomplished at very much lower pressures: crowning may be carried out leisurely, for the cold water may be depended upon to retain carbon dioxide up to its saturation point, and the detrimentally excessive quantities of air, which are so characteristic of the high-pressure process, are avoided.

Bacterial and particularly yeast spoilage are the most serious causes of beverage deterioration. Maintaining the beverage cool during storage markedly reduces losses from these agencies. Finally, the beverage must be served cold. Thus, in every phase of the carbonated beverage industry —production, preservation, and consumption — refrigeration plays a prominent role. In fact, it is through the development and emphasis on refrigeration that the carbonated beverage industry, as it is known today, is made possible.

The presence of carbon dioxide is the distinguishing characteristic of carbonated beverages. Its function is two-fold; first, it is responsible for the sparkle and the characteristic stimulating and refreshing properties, and second, the carbon dioxide aids materially in the preservation of the beverage. It is customary to express the concentration of carbonic acid in terms of volume of the gas per unit volume of beverage. The quantity of gas employed must be varied for different beverages; thus, for example, orange drinks generally contain 1.5 to 2 volumes of gas, while gingerales are prepared with 3.5 to 4 volumes of carbon dioxide.

It is important to maintain the carbonic acid concentration of a given beverage relatively constant, but field surveys have disclosed marked variations in the carbon dioxide content of what were pre-

From a paper presented at the Food Technology Conference sponsored by Massachusetts Institute of Technology, Cambridge, Mass., Sept. 14-17. Copyrighted, 1937, by American Bottlers of Carbonated Beverages, Washington, D. C.

sumably similar products produced by different plants. And, in some instances, different bottles from the same plant have shown wide variations. For example, in one plant, with proper and adequate control, the concentration of carbon dioxide in different bottles of gingerale was found to vary slightly between 3.7 and 4.0 volumes (a variation of less than 10 per cent), whereas in another plant, which did not take advantage of adequate technical control, the variations observed were from 0.9 to 3.6 volumes, or 400 per cent.

To maintain a desired carbonation, the bottler depends on:

1. Properly refrigerated water.
2. Pressure gages on the carbonator and filler.
3. Pressure gage for testing the final product.
4. Proper closure.

The bottler recognizes that in order to obtain the desired concentration of gas, the water must be maintained at a sufficiently low temperature (preferably 36 to 40 deg. F.) and that the carbon dioxide should be applied at a constant predetermined pressure. Our experience is that low water temperatures are successfully maintained, but that absolute faith is frequently put on the pressure gages at the carbonator and filler, and testing of the final product is not adequately appreciated. The almost child-like faith in the dependability of the carbonator and filler pressure gages as criteria of carbonation is not warranted. These gages are being continually subjected to wear and tear, with the inevitable result that they are occasionally in error. The gages of the carbonator and filler should be looked upon primarily as guides and not as absolute measures of final carbonation of the product. The only way to determine the latter, obviously, is to actually ascertain the volume of gas in a certain proportion (say one bottle in every 25 to 50 cases) of the finished product.

Leaky crowns and inadequate closures are another source of carbonation variation. Submerging the filled bottles in water will generally serve to detect rapid leakers, and testing stored samples of beverages for carbon dioxide pressure will serve to detect slow leakers if this defect is at all common in a plant. A simple control procedure consists of storing a half dozen or more bottles from each batch and determining gas pressure from time to time over a period of one month.

The various pressure gages must themselves be compared with a standard gage from time to time to detect errors and defects. In view of the small size of the individual plants, the national association of the carbonated beverage industry—American Bottlers of Carbonated Beverages—has made provision to serve the bottler in this and other technical-control procedures.

THE APPEAL of carbonated beverages is, of course, to the taste of the consumer, and it is therefore essential that a given product should have as nearly as possible the same taste, wherever it may be obtained. It has been the experience of the industry that, even in instances where the concentrated flavored syrup is produced at a centrally located plant and distributed to bottling plants throughout the country, tastes of the beverages in various localities have been quite different. Under the conditions stipulated, the primary variable is, of course, the carbonated water. In view of the fact that the acids employed in beverages are a significant factor in taste, and that the differences in alkalinity of waters in different sections of the country necessarily are quite great, attention has been focused particularly on the neutralizing effects of water alkalinity on beverage acidity, and consequently, flavor. Recently there has been developed in the industry a tendency to treat water to remove the bicarbonate alkalinity with a view to producing nationally distributed products which will have more nearly the same taste. One of the processes of alkalinity removal consists of the addition of lime, or lime and alum, to the water, mixing thoroughly and then storing for a short time (30 minutes to an hour) to afford an opportunity for sedimentation, or continuous flow sedimentation tanks may be used. The supernatant liquid is then passed through a sand or other filter. Storage tanks employed are frequently 200 to 500 gal. in capacity. A plant which has not been accustomed to cooling its water (as is generally the case with plants using well waters which are naturally quite cool, 50 to 55 deg. F.) and which installs one of these alkalinity removal plants has introduced a storage period which formerly did not exist. There is thereby introduced an opportunity for a rise of temperature of the water, which, in some instances, has turned out to be quite appreciable, as, for example, during periods of shutdown, which are quite frequent in small installations. Where equipment is installed to remove or control alkalinity of water, it becomes essential to simultaneously provide for adequate refrigeration and control of the temperature of the water after treatment.

Suspended matters, tastes and odors periodically encountered in water supplies constitute serious problems for the bottler, who is generally not qualified technically to effectively cope with them. For the removal of suspended matters, sand or stone filters, with or without the aid of coagulents and generally supplemented with paper-disk filters, are very commonly employed, in most instances with considerable success. Charcoal filters or ozonation of water followed by filtration through activated carbon have been found to be very effective for the control of taste and odors.

DETERIORATION of beverages is due primarily to yeasts and bacteria. The sources of these agents of spoilage are unsterile sugar syrups, contaminated pipe lines or utensils and improperly washed bottles. Boiling sugar syrups and thoroughly cleansing, washing and then sterilizing apparatus with hot water or chlorine solutions may be depended upon to control spoilage from these sources.

The problem of bottle washing has received considerable attention. The economical production of a suitably and adequately cleaned and sterilized container is fundamental to the success of a beverage-bottling plant. In mechanical bottle washing, alkaline detergents (consisting of caustic soda, sodium carbonate, trisodium phosphate and, recently, sodium metasilicate, in various proportions) are generally employed. Studies by the research staff of the American Bottlers of Carbonated Beverages have demonstrated that, on the basis of present knowledge, caustic soda must form the foundation for bottle-wash-

Production problems covered in this article are found in other food industries than that which bottles carbonated beverages. Among these problems are treatment of water and washing of bottles, which make the information on these pages of value to

All Food Manufacturers

ing compounds. The milder alkalies, sodium carbonate, trisodium phosphate, and sodium metasilicate, may be added for their auxiliary value, but they must not be present in sufficient quantity to interfere with lubrication properties of caustic soda on bottle-washing machinery. The ABCB recommends the following minimum requirements as to composition, concentration, temperature and period of exposure for mechanical bottle washing:

"Unclean bottles shall be exposed to a 3 per cent alkali solution, of which not less than 60 per cent is caustic (sodium hydroxide), for a period of not less than five minutes at a temperature of not less than 130 deg. F., or to an equivalent cleansing and sterilizing process."

The majority of plants do not have trained personnel or laboratory facilities for standard chemical titrations. A rather simple tablet titration has been developed to enable the bottler to insure maintenance of the desired alkali concentration.

For determination of total alkalinity, a tablet consisting of potassium acid sulphate ($KHSO_4$) and the indicator tetra-brom-phenol-sulphonphthalein (brom phenol blue) is employed. This indicator is violet-blue in alkaline and yellow in acid solutions. Each tablet contains sufficient acid to neutralize alkali equivalent to one per cent sodium hydroxide when added to 10 c.c. of solution. The tablets are so molded that half or quarter tablets may be easily employed. The number of tablets required to neutralize the alkali in 10 c.c. of bottle-washing solution thus becomes a direct measure of the alkalinity of the test solution expressed in terms of per cent sodium hydroxide.

For determination of caustic alkalinity, which is considered to be the essential ingredient in bottle-washing compounds, the procedure is similar except that: 1. A tablet of barium chloride ($BaCl_2$) is first added to the test solution to precipitate the carbonates and phosphates and most of the silicates which might be present; 2. the indicator employed is Trapaeolin O; and 3. the quantity of $KHSO_4$ present in each tablet is sufficient to neutralize caustic alkalinity equivalent to one-half per cent sodium hydroxide. The color of the indicator is deep red orange in alkaline and yellow in acid solution.

During the past year, the ABCB traveling laboratory examined 106 samples of bottle-washing solutions. It was found that, in 41 plants which were relying upon the hydrometers or other control procedures suggested by washing-compound supply houses, only 18, or 44 per cent, of the washing solutions were up to the strength the bottler thought he had. In contrast to this, of 65 plants which were employing the tablet titration described above, 60, or 92 per cent, were maintaining their bottle-washing solutions at the desired concentration.

The tablet titration process is obviously a convenient and dependable method; it is peculiarly well adapted to the conditions encountered in the carbonated beverage industry, and should be found equally applicable for the control of the bottle washing solutions in other industries.

It is recognized that the cleansing and sterilizing efficiencies are the resultants of many factors, among which time of exposure, temperature and concentration of the detergent are particularly important variables. It has further been ascertained that for sodium hydroxide at a constant temperature, the logarithm of the concentration of caustic employed is inversely proportional to the logarithm of the killing time, as may be seen from the accompanying chart. Recently, Mr. C. R. Arnold and Mr. John M. Sharf of the ABCB research staff have suggested the following equation for expressing the relationship between temperature, killing time and concentration of sodium hydroxide:

$$\log. \theta = K - a \log. c - bt$$

where

θ = killing time in minutes

c = concentration of NaOH in per cent

t = temperature in degrees Farenheit

K is a constant associated with the resistance of the test organism or with other stipulated conditions, and a and b are constants associated with the detergent. For sodium hydroxide a and b have been found to be 1.7960 and 0.03137, respectively.

The New York City Health Department stipulates a minimum holding time of seven minutes, a temperature of 150 deg. F. and a concentration of 2 per cent sodium hydroxide. For these conditions, K is 6.09125. By use of the formula just described, it is possible to develop tables of germicidal sterilizing equivalents so as to enable the bottler who is equipped to employ a higher temperature or a longer holding period than the minimum stipulated to reduce the concentration of alkali, or in fact to vary any of these factors as may be deemed desirable or necessary for a local situation. Table I illustrates the use of this formula for the determination of the germicidal equivalents with respect to concentration of NaOH, temperature and holding period for the conditions stipulated by the New York City Health Department for the sterilization of milk bottles.

Further to assist the bottler to better control his product and operating processes, the American Bottlers of Carbonated Beverages has designed modified sugar hydrometers and measuring vessels and has issued a series of educational bulletins on various items concerned with manufacturing processes, particularly sanitation in the bottling plant. During the past year, a motorized laboratory, completely equipped and specially adapted to cope with the chemical, bacteriological and engineering problems peculiar to this industry, has been developed and sent out into the field to aid individual plants and to gather pertinent information.

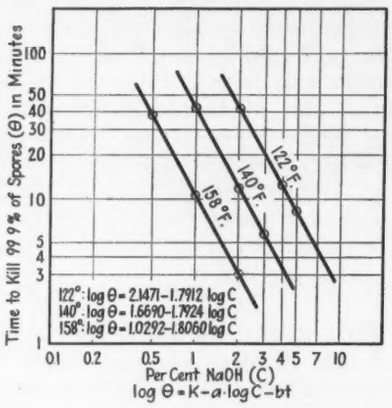


Chart showing the germicidal efficiency of NaOH

Table I—Germicidal Equivalents (Killing Times for Designated Temperatures and Concentrations of NaOH)

(Base: New York City Specifications For Milk Bottles)

Per cent NaOH	1.0	1.5	2.0	2.5	3.0
Deg. F.	Time to kill — in minutes				
110	432.0	200.0	125.0	83.8	60.4
120	210.0	102.0	60.8	40.7	29.4
130	103.0	49.5	29.6	19.8	14.3
140	49.8	24.1	14.4	9.7	7.0
150	24.2	11.7	7.0	4.7	3.4
160	11.8	5.7	3.4	2.3	1.6
170	5.7	2.8	1.7	1.1	0.8
180	2.8	1.3	0.8	0.5	0.4

$\log \theta = 6.07780 - 1.7912 \log c - 0.03129\, t$

θ = killing time in minutes: c = per cent NaOH:

t = temperature in degrees Fahrenheit.

BYPRODUCTS OF MILK

Methods of conversion which will help solve the burdensome surplus-milk problem.

PART I

By L. V. BURTON
Editor, Food Industries

JUDGING BY DEVELOPMENTS in the past year, the time is not far away when milk will assume a much more important place in the industrial world as a raw material for products other than those which are commonly known as dairy products. The latter include cream, powdered milk, condensed milk, butter, whey butter, cheese, cottage cheese, buttermilk, cultured milk, ice cream, chocolate milk, evaporated milk and the like. All of these have whole milk as their raw material.

Byproducts of milk which are less known to the general public are casein, alpha lactose and beta lactose, albumen, whey powder, lactic acid, calcium lactate as well as a whole series of lactates of the metals, copper, iron, ammonium, magnesium, nickel and other metals. Naturally there is no sharp line of distinction between milk products and milk byproducts.

None of the foregoing substances derived from milk are curiosities in the sense of being rare, but they are interesting because they are or can be made commercially from milk and because there is an active demand for many of them today. For many years a number of concerns, as well as the U.S. Department of Agriculture, have been actively studying the problem of conversion of surplus milk into more valuable products. Heretofore much of the material, such as the whey, has gone down the sewer. The ever-present problem of giving the farmer a cash return commensurate with his outlay for producing milk, over and above the amount which the urban dweller will consume, is intimately tied up with the commercial success of the byproduct business.

One of the pioneer companies in this effort to find a profitable outlet for surplus milk is the Sheffield Byproducts Co., a subsidiary of Sheffield Farms, Inc., which in turn is a subsidiary of National Dairy Products, Inc. Sheffield Farms supplies fluid milk to New York's metropolitan area. During many years of study and experiment, Sheffield By-Products Co., under F. L. Chappell, has slowly built up the byproducts business, a part of which is described in this article.

Though not yet a self-sustaining profit-making operation, the By-Products Co. has persevered until it is possible to visualize the time when fluid milk can be converted into enough other substances of a sufficiently high value to warrant the purchase of milk for byproduct manufacture at a price approximately equivalent to the price now paid for milk to be made into cheese, evaporated or condensed milk or possibly ice cream. This price is almost always lower than the price the farmer gets for milk sold to the general public as fluid milk for the reason that milk is so very perishable. If it cannot be sold for prompt consumption it must be salvaged by conversion into another product which is less perishable.

Products from the salvage operation must be definitely less perishable or else there will be no salvage. To explain the intricacies of the milk-price structure requires a lengthy excursion into one of the most complex fields of marketing and distribution. Suffice it here to say that the population of a city has a fluctuating demand for milk. Hot weather increases the demand not only for milk but for ice cream as well. Cold weather usually causes the reverse to occur. And there are other factors that make milk sales fluctuate, such as factory employment, vacations and the like.

On the other side is the fluctuation in production of milk. Weather, pasture conditions, price of feed, supply of feed, the market for livestock for slaughter and a host of lesser factors affect the production of milk. Nevertheless, a still more important factor is the actual number of cows in production, a factor that is no more under the control of the dairy company than are the other factors that affect supply and demand. In spite of this, the dairy company must take all of the milk which its patrons under contract may produce, and it must never fail to have enough fresh milk on hand to supply the maximum demand.

Under conditions such as these there is bound to be more milk than can be consumed every day, and this extra milk becomes "surplus." In no way does its quality differ from the milk that went into the city, except that the metropolitan consumers just don't want any more milk on that particular day. Yet tomorrow there be available the milk from two or more milkings and today's surplus must be disposed of today. That is the basis of the byproduct business. As Sheffield handles it, the surplus is kept in refrigerated storage, with the identical degree of care and sanitation that is given to market milk, right up to the point where it is used for byproduct manufacture.

Thus, much of the surplus is often suddenly taken away, which may leave the byproduct plant with little or no material available for that day's operations. Such a condition will inevitably occur as long as milk byproduct manufacture is a salvage operation. It seems likely that the future will see this line of manufacture become less and less of a salvage operation and grow to the point where it can stand on its own economic feet,

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▶ ***How many of the operations involving large-scale fermentation, clarification and filtration are carried out is of interest to many manufacturers of liquid foods. Also, this article, together with the next installment which deals with the production of lactic acid, will be of interest to all milk companies as well as manufacturers who may need to acidify products such as:***

Ice Creams (Sherbets)
Pickled Olives
Candy
Yeast
Cheese

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pay the going price for milk for manufacturing purposes and make a reasonable profit out of it.

Many of the byproducts made by Sheffield are chemicals in the sense that they are not edible, but others, like pure lactic acid, are perfectly edible. In a sense, the operations of this company are in the position corresponding to Quaker Oats Co's development of furfural about ten years ago. At that time, nobody was very certain what use could be made of furfural, a chemical made from oat hulls. In the course of time a demand for furfural has gradually built up until it is now a normal article of commerce sold in tank-car lots instead of being a scientific curiosity. And the furfural department of Quaker Oats Co. is a profitable operation. In the same way, lactic acid is finding new markets either as the acid or as the metallic salts, and in time the byproducts of milk will probably be in profitable demand.

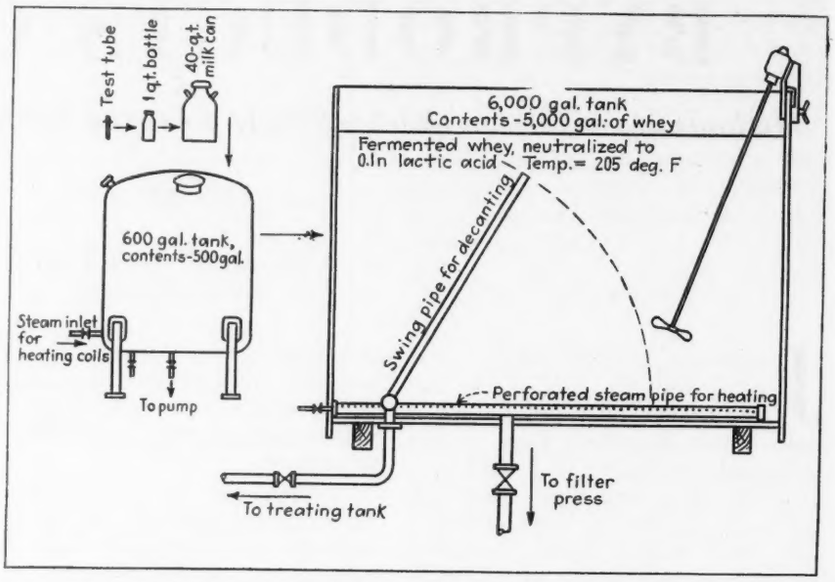
Test tube
1 qt. bottle
40-qt. milk can
6,000 gal. tank
Contents - 5,000 gal. of whey
Fermented whey, neutralized to 0.1n lactic acid — Temp. = 205 deg. F
600 gal. tank, contents-500 gal.
Steam inlet for heating coils
To pump
Swing pipe for decanting
Perforated steam pipe for heating
To filter press
To treating tank

Fig. 1. Building up the fermentation from a test tube to a 6,000-gal. tank.

Separation of Cream is First Step

When it is time to release surplus whole milk for byproduct manufacture, the first step is to separate the cream, for there is always a market for cream either as such or for butter or ice cream manufacture. Cream, therefore, never enters into the byproduct department. It is much too valuable. The skimmed milk is pumped over into wooden tanks and becomes the raw material for the byproduct department. Out of 100 lb. of whole milk, there is normally separated 10 lb. of cream, leaving 90 lb. of skim.

Precipitation of Casein

The second step in the manufacture of byproducts of milk, as carried out by Sheffield By-Products Co., is to precipitate the casein by either the addition of hydrochloric acid or lactic acid, depending on the trade for which it is destined. When lactic acid is used as the precipitating agent, it is entirely recovered later on and is not lost, as is the case when hydrochloric acid is used. Sheffield's casein production is a patented continuous process which will be described in further detail in another article to be published later. The liquid separated from the casein is called casein whey and contains lactalbumin, lactose and vitamin G as well as certain mineral salts. After the casein has been separated by precipitation, washing, pressing and drying, there are three possible lines of manufacture of the whey: 1. the whey can be evaporated and dried into a product called whey powder (used for animal feed); 2. it can be converted into pure lactose and lactalbumin; 3. into lactic acid (or its derivatives) and into lactalbumin. Details of the lactic-acid process will be given in the next article.

TABLE I—Composition of 1 Qt. of Average Surplus Milk

Water	87.17 per cent =	839 grams
Vitamin G..	523 units	
Fat	3.74 per cent =	36.47 grams
Casein	2.87 per cent =	27.99 grams
Lactose	4.94 per cent =	48.18 grams
Lactalbumin.	0.56 per cent =	5.46 grams
Mineral Salts	0.72 per cent =	7.02 grams

TABLE II—Recovery of Products from Whole Milk

	Theoretical Amount	*Actual Recovery*
Cream (Separated at 90 deg. F.)	Fat = 3.74 %	10 lbs.
Casein	2.87 %	2.75–2.80 %
Whey	87.13 %	75 %

Table I shows what the milk consists of before taking out the butter fat.

Table II shows how theory and practice compare when removing casein and whey from the skim milk.

Treatment of Whey Powder

The recovered liquid portion resulting from casein production, comprising about 75 per cent of the original

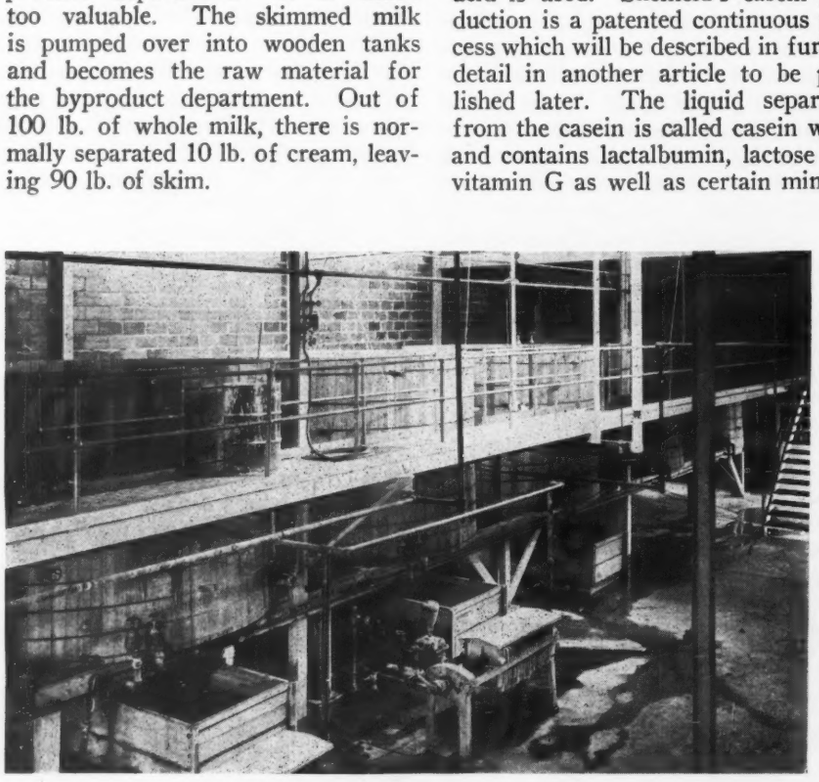

Fig. 2. Row of fermentation and treatment tanks.

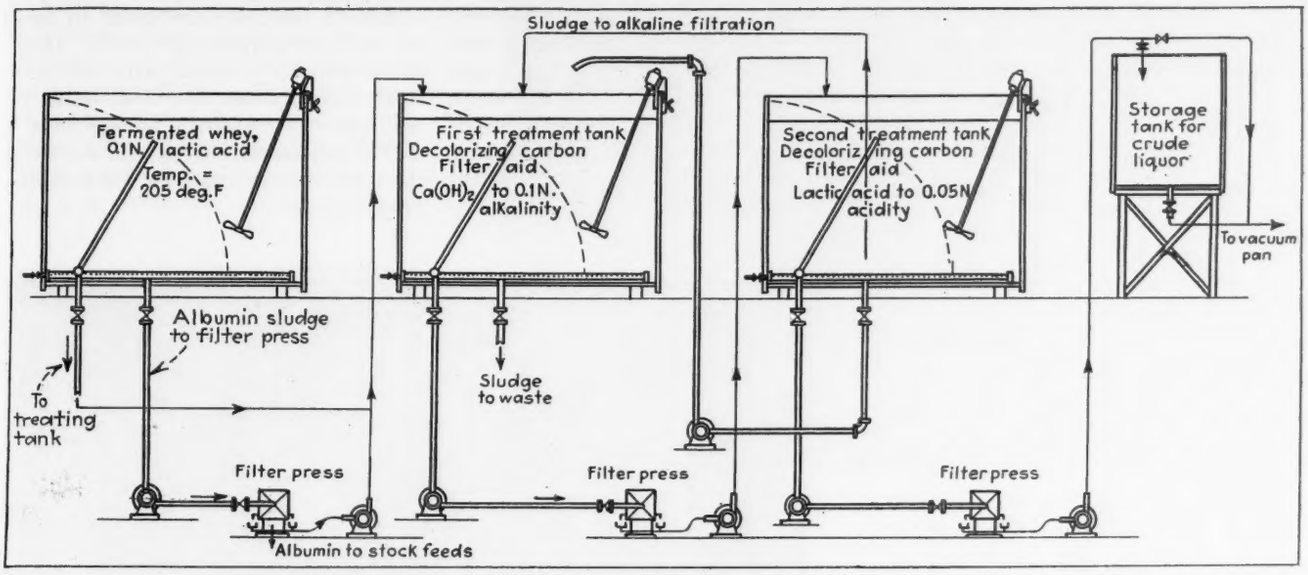

Fig. 3. Flow diagram for filtering fermented whey.

whole milk, is composed of water, lactose, lactalbumin and vitamin G. The simplest disposal of the whey is to concentrate it to a thick liquid, mix it with some whey that has already been dried so that the mixture has a granular consistency, then dry and grind it to a powder. This product is the whey powder of commerce and is largely used for animal and poultry feed. Unfortunately, the market for whey powder is a low-priced market, and the salvage value here is not attractive except as it may possibly avoid a waste-disposal problem. Most states or cities will not permit large amounts of milk wastes to be dumped into streams or sewers because the milk sugar present raises hob with the operation of most types of sewage-disposal plants, especially those of small communities. The yield of whey powder is about 5½ to 6 per cent of the weight of the skim milk used in its manufacture.

Lactose Production

The next possibility is the removal of the lactose by coagulating the lactalbumin, filtration of the liquid, evaporation of the filtrate and crystallization of the lactose. Unfortunately, again the market for lactose, pure or crude, in the alpha or beta form, is limited mainly to use in pharmaceuticals. It has been said of lactose that no matter what industrial use is proposed for it, the job can be done better and cheaper by some other sugar. But that remark was made before the development of a process for converting it into lactic acid. It is now possible to make lactose into acid and in turn, convert this product into a series of salts, all of which have a much higher value than the original milk sugar.

Lactic Acid Production

The process of conversion of the lactose into lactic acid is based on a method developed by bacteriologists in the U. S. Department of Agriculture, Bureau of Dairy Industries, of which Dr. L. A. Rogers is chief. Their contribution, which has been developed into an industrial process by Mr. Chappell and his associates, and the Baltimore Research laboratory of National Dairy Products Corp., is to ferment the lactose with *B. bulgaricus,* accompanied by intermittent neutralization of the acid which develops so as to avoid complete stoppage of the conversion into the acid by the accumulation of an acidity too high to permit the further growth of the organism.

In this manner the acid is accumulated in the form of soluble calcium lactate from which it can be recovered by coagulation of the lactalbumin, filtration, purification by charcoal, crystallization and drying. The purification can be carried out to any desired degree by the simple procedure of recrystallization. The calcium lactate is now the basis of the production of lactic acid by treatment with sulphuric acid. This precipitates the calcium as calcium sulphate which can be removed by filtration and leaves the lactic acid in solution which now can be concentrated by evaporation.

Casein whey contains about 4.6 per cent of lactose which is theoretically convertible into 7.8 per cent of hydrated calcium lactate, $Ca(CH_2CHO\text{-}HCO_2)_2 .5\ H_2O$, (figuring on the basis of the weight of casein whey started with). In practice, however, only 5.5 per cent of crude calcium lactate can be recovered, which when converted into lactic acid of 100 per cent strength, is equivalent to 4.6 per cent of the weight of the casein whey. However, the trade demands that acid of 50-per cent strength, which gives a theoretical yield of 9.2 per cent of this acid as the mark to shoot at.

Three grades of 50-per cent lactic acid are produced: commercial, edible, and water white. Actual practice gives the following yields:

Theory	Commercial	Edible	Water White
9.2	8.6	8.3	8.0

A method is not a process, however, as any food engineer well knows. To convert this simple scientific method into a commercial process has been the work of years, most of which has been done entirely by the Sheffield By-Products Co. under the direction of F. L. Chappell, manager, aided by Stoddard Stevens, chemist, and the Baltimore research laboratory of Sealtest System Laboratories, Inc. Operations carried on a large scale are quite different from laboratory experiments.

Building Up the Starter Culture

First is the problem of the right organism in proper quantities. For this the Sheffield By-Products Co.

depends upon the U.S. Department of agriculture. The *B. bulgaricus* is received in test-tube cultures but is not a pure culture. An unidentified yeast grows symbiotically with it, and as a result of its presence the acid forming organism is a much more vigorous fermenter than without it. Whether this is a result of "Bios" or of vitamin formation, or what, is not known definitely. It works, however.

This starter culture is carried along in sterile milk in quart bottles until it begins to "run out," i.e., if it fails to produce the right amount of acid or becomes contaminated with gas-forming bacteria. Then a fresh starter culture is obtained from Washington.

Because it is general practice to start an industrial fermentation with a culture of 10 per cent of its size, it is necessary to build the culture up from the test tube to 500 gal. before starting a 5,000-gal. tank of whey. (See Fig. 1.) This is done by inoculating a quart of sterile skim milk with a portion of the contents of the test-tube culture. It is then incubated at 110 deg. F. for 24 hours, then stored at 50 deg. F. until needed. The quart culture is next poured into a 40-qt. can of pasteurized skim milk, incubated for 24 hours at 110 deg. F. and thereafter is stored at 50 deg. F. In building up the culture, the next step is to inoculate a glass-lined tank containing 500 gal. of whey made from pasteurized milk with the 40-qt. culture. Another 24-hour wait ensues during which the tank and its contents are kept 110 deg. F. by means of internal heating coils. The starting tank is now ready, after a minimum of four days required to build it up. It must be used fairly promptly, for so much acid will form that it will cause the destruction of the bacterial culture. To inoculate a 5,000-gal. tank of whey, the starter is pumped into the tank by small centrifugal pumps.

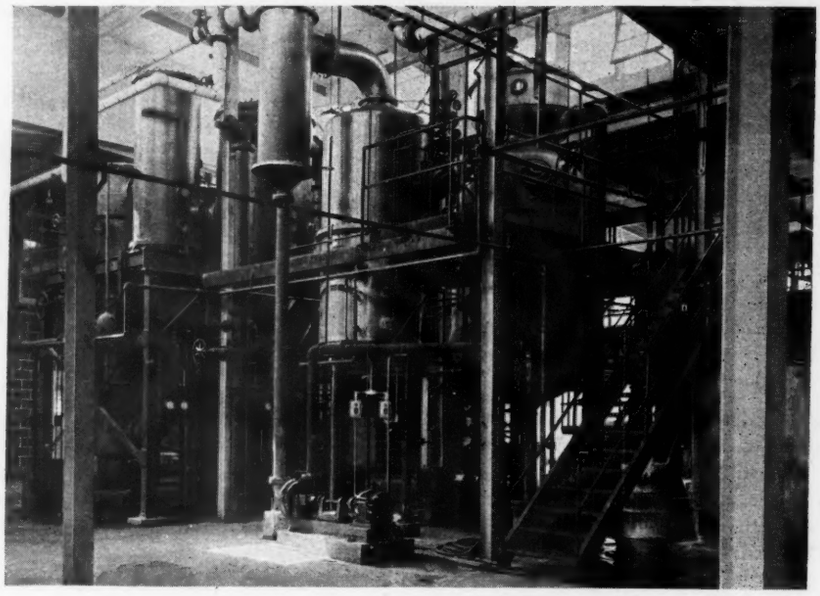

Fig. 5. Vacuum evaporators needed in recovery of milk byproducts.

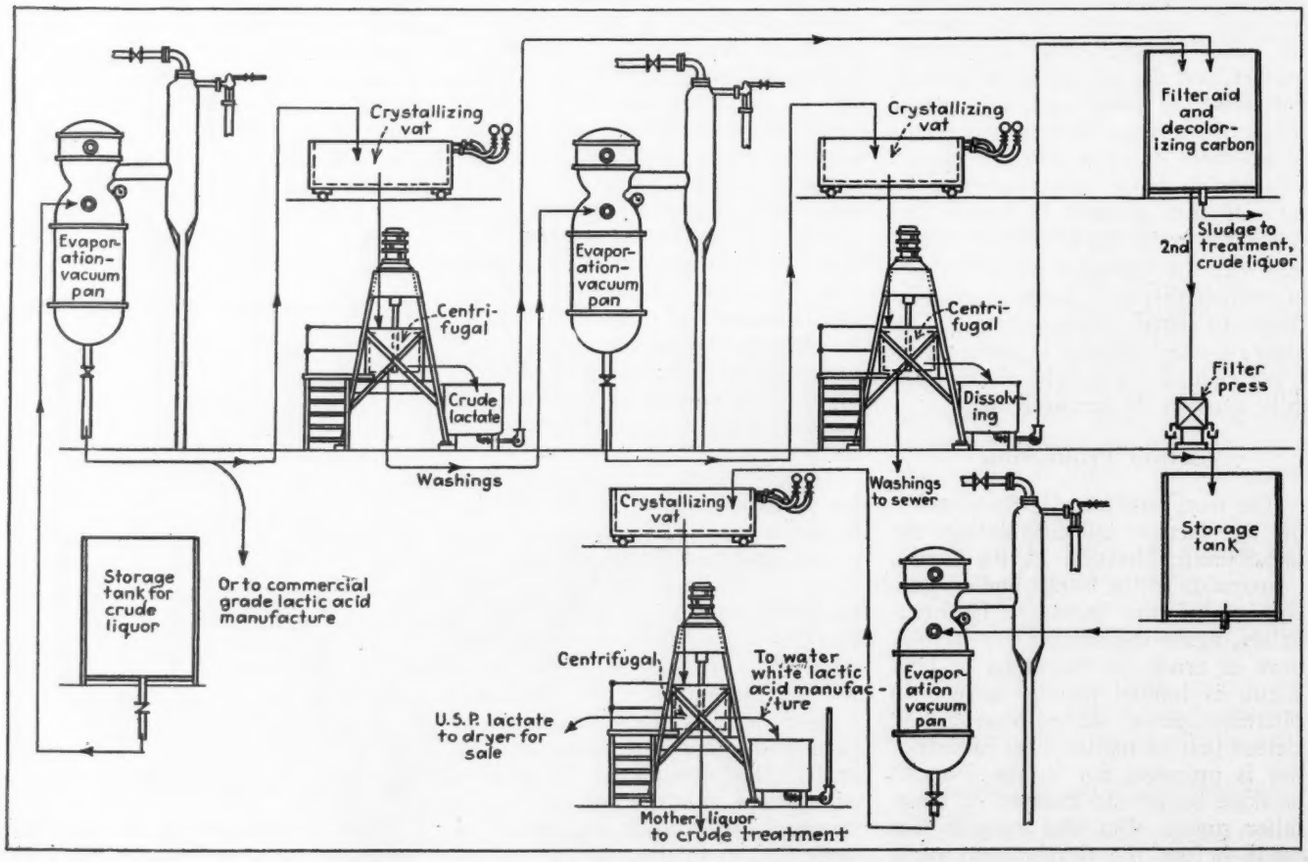

Fig. 4. Flow diagram for production of U.S.P. calcium lactate.

The Fermentation

The fermentation is carried out in vertical cylindrical wooden tanks holding 500 40-qt. cans (5,000 gal.). In the bottom of the tank is an outlet drain for cleaning purposes. Also, there is a 4-in. perforated brass heating pipe across the bottom to permit

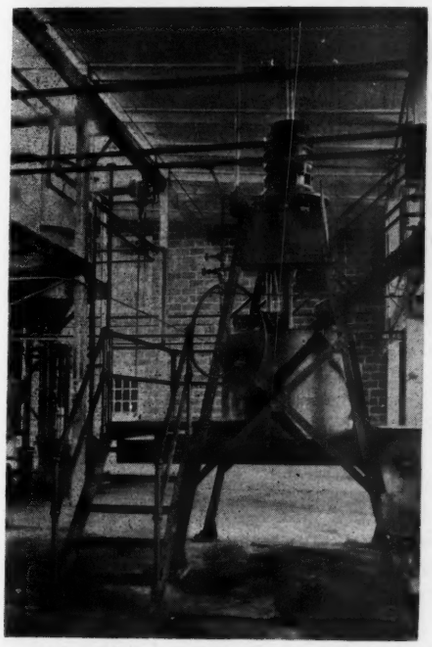

Fig. 7. Basket centrifuge for separating calcium-lactate crystals from mother liquors

blowing in steam for the purpose of keeping the batch warm and for subsequent heating up purposes. The fermentation is carried out at 110 deg. F. Though the fermentation is mildly exothermic (gives off heat), in cold weather it must be aided by low-pressure steam or the temperature will fall too low for rapid production of acid. It is slow enough at best. There is also another 4-in. brass pipe on a swinging elbow inside at the bottom of the tank. This pipe, about 6 ft. long, is held up in a vertical position by a rope by means of which it can be lowered to any desired level (See Fig. 1). Its purpose is to draw off the clear liquid at the top after settling of the coagulated albumin by the operation known as decanting. In addition to all this is a portable motor-driven stirrer with a 12-in. propeller to circulate the contents of the tank.

In front of the row of fermentation tanks is an elevated platform for the use of the operators, and at a convenient place is located a shelf for conducting the necessary chemical-control tests.

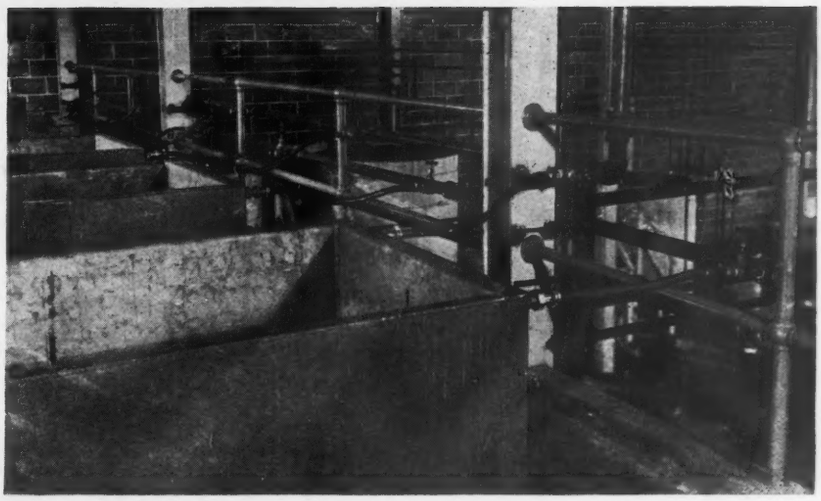

Fig. 6. Portable water-jacketed crystallizing vats, showing details of water connections.

Assume that the tank has been properly cleaned and sterilized with a chemical sterilizer, then washed clean again with pure water. The 5,000 gal. of whey are pumped into the tank. An important feature of the Sheffield operation is that their whey is made from clean, pasteurized milk that renders it nearly free from all bacteria. Other concerns in this line of work do not always give the same care to their surplus milk as they give to their market milk, and as a result they may experience contamination troubles that complicate subsequent factory operations.

The temperature of the whey is next brought to 110 deg. F. by live steam, and the 500 gal. of starter culture is pumped in from the glass-lined starter tank. Fermentation proceeds for about 42 hours, after which it is complete. But the tank requires regular attention, for it must be limed every six hours to neutralize the acid formed. The lime is in the form of a slurry of slaked chemical lime. This is lime that is nearly pure calcium hydroxide and is practically free from magnesium. Liming is carried to the point of reducing the acid to 0.6 per cent lactic acid, using phenolphthalein as the indicator.

Six liming operations are needed on each fermentation, which means that somebody has to stay up at night. At the end of 42 hours the fermentation part of the process is complete and the tank is neutralized with more lime to 0.1 per cent lactic acid. Then the steam is turned on to bring the entire batch up to 205 deg. F. which will coagulate the lactalbumin.

Within about ten minutes, the coagulated albumin has settled to the point where the clear liquid at the top can be decanted through a pressure filter.

The purpose of the six successive limings of the fermenting whey, as previously explained, is to neutralize the acidity so that the fermentation will not reach an equilibrium but will keep going until the lactose is all converted into lactic acid. Without it, the lactic acid would build up to a point where the bacteria could no longer function. Hence by adding enough lime, as calcium hydroxide, to bring the acidity down to 0.3 per cent, the acid is captured as calcium lactate but is not active. Those who understand chemistry known how easy it is to change the calcium lactate into lactic acid by the mere addition of sulphuric acid, according to the following reaction.

$$\underset{\text{Calcium Lactate}}{Ca(CO_2 \cdot CHOH \cdot CH_3)_2} + \underset{\text{Sulphuric Acid}}{H_2SO_4} \rightarrow$$

$$\underset{\text{Calcium Sulphate}}{CaSO_4} + 2\ \underset{\text{Lactic Acid}}{CH_3CHOHCO_2H}$$

In the foregoing equation of a reaction, because the calcium sulphate is almost insoluble it precipitates and can be filtered out, leaving only the dilute solution of lactic acid to be concentrated by evaporation in a vacuum evaporator.

So much for theory. In actual practice there are a multitude of details, purification and other precautions which will be related here.

Filtering the Fermented Whey

When the fermentation is complete, the contents of the tank is a pale greenish looking liquid which contains the calcium lactate is a very dilute solution. It also contains the lactalbumin, the mineral salts and the vita-

(*Turn to page 617*)

Oat Flour *Improves* KEEPING QUALITY of Fatty Fish

Tests with salt mackerel prove value of antioxidant in reduoing rancidity and reveal most effective ways of applying it

By J. M. LEMON, M. E. STANSBY and C. E. SWIFT

U. S. Bureau of Fisheries Laboratory
University of Maryland, College Park, Md.

▶ ***Rancidity is an arch enemy of fatty foods. Salt mackerel is a food of that type. So the method of improving the keeping quality of that product, paralleling as it does similar work done on lard, bacon, potato chips, nuts, salad dressing and packaging materials for fat-containing foods, is of significance to***

Fisheries
Meat Packers
Potato Chip Manufacturers
Nut Packers
Salad Dressing Manufacturers
Shortening Manufacturers
Bakers

IT IS A WELL KNOWN FACT that the cereal flours have a very definite value in preventing the combination of fats and the oxygen of the air, commonly known as oxidation, thus enabling fat containing foods to remain in storage in an edible condition over a greater period. Oat flour has been successfully applied to dairy products such as ice cream and frozen cream[1], to meat products such as lard and bacon[2], and to such miscellaneous products as potato chips, nuts, salad dressing and special packaging materials[3], [4], [5]. In order that the fisheries might be benefited by this treatment, a cooperative fellowship was inaugurated by the Musher Foundation, Inc., at the U.S. Bureau of Fisheries Technological Laboratory, located at the University of Maryland, College Park, Md., for the purpose of making a detailed study of the effects produced in fatty fish by treatment with oat flour. Early in the investigation it was observed that the use of salt greatly increased the efficiency of the treatment. For this reason it was decided to study the salt-mackerel industry.

According to the latest statistics of the Bureau of Fisheries for the year 1935, there were salted in the United States, exclusive of imports, approximately 5,500,000 lb. of mackerel, valued at $350,000. The mackerel is one of the fatty fish, having an average oil content of approximately 12 per cent. This oil belongs to a class known as unsaturated; that is, it has a capacity for absorbing and actually combining chemically with oxygen from the air. The result of this combination is a rancid substance with a strong flavor which when eaten leaves an aftertaste that may remain in the mouth for several hours.

This oxidation occurs principally during the preparation and storage of the mackerel because the fish is generally salted during July or August and carried in storage for eight to ten months before the opening of the following season. This deterioration can be eliminated only by the use of some substance which will retard the combination of oxygen of the air and the oil at ordinary temperatures. To accomplish this might well result in substantially increased consumption of salt mackerel.

The samples of salt mackerel were prepared under the supervision of an accredited investigator at one of the large commercial fishery plants in Gloucester, Mass., during the season of 1936. They were then forwarded to the Bureau of Fisheries Laboratory and stored for examination over a period of approximately ten months. This investigation has progressed to a point where it is possible to state definitely that an oat-flour treatment is of value in retarding oxidation and improving the keeping quality of salt mackerel.

The oat flour used in this work was of two grades: pulverized whole oats, referred to as Avenex No. 3; and finely milled dehulled oat flour, referred to as Avenex No. 4. The necessary mackerel were obtained directly from the fishing boats, and the split salt mackerel were prepared as follows:

1. Two pails in commercial manner (packed in brine and then repacked in fresh brine after eight days).

2. One pail of fish soaked ten minutes in 15 per cent Avenex No. 3 suspension and 10 per cent salt brine, then put up in commercial manner by immersing directly into brine without any of the adhering salt or oat flour being washed off.

3. Fish covered with salt containing 30 per cent Avenex No. 3, then packed in commercial manner (repacked in fresh brine after eight days).

TABLE I—Peroxides of Salt Fish
(Averages of 2 or more determinations)

Sample	Peroxide value 0 Months	1 Month	2 Months
1	11.3	6.2	116.0
2	14.4	17.5	2.5
3	15.1	10.3	2.0
4	14.7	8.0	2.0
5	14.9	8.0	90.5
6	13.3	3.6	86.0
7	13.6	11.0	142.0
8	10.2	7.2	110.0
Fillets			
A	10.0	12.8	153.5
B	10.6	11.1	125.5

4. Same as No. 3 but 10 per cent Avenex No. 3.

5. Same as No. 4 but repacked in brine containing 5 per cent Avenex No. 4.

6. Same as No. 5 but repacked in brine containing 2½ per cent Avenex No. 4.

7. Fish were salted in regular commercial manner, then repacked in brine containing 5 per cent Avenex No. 4.

8. Same as seven but repacked in brine containing 2½ per cent Avenex No. 4.

The fish of No. 2 were noticeably coated with the flour after soaking but upon repacking in brine this objection was largely overcome. Nos. 3, 4, 5 and 6 were somewhat dry due to the flour in the salt and consequently could not make their own pickle. Sufficient brine was added afterwards in order to have the mixture wet enough for the salt to strike through properly. Nos. 5, 6, 7 and 8, when repacked in flour, did not appear to have an objectionable amount of the flour present.

All of the pails were headed for shipping in the usual manner.

In preparing the salt-mackerel fillets, the fillets were first salted in regular commercial manner until struck and then packed in quart Mason jars under the following conditions:

A. Four jars of mackerel packed in saturated salt brine.

B. Four jars packed in brine containing 2½ per cent Avenex No. 4.

The peroxide number is considered a standard test for rancidity, and is generally accepted by the oil industry as an index to oxidation. The Wheeler method was used for these samples.[6] The test was made upon all of the samples immediately upon their arrival at the laboratory and each month thereafter. The results are shown in Table I. As is indicated in this table, the results are erratic for some unknown reason, and the test could not be depended upon to give a consistent index to oxidation. After the fourth month these tests were discontinued, since it was not possible to get any results which could be correlated with rancidity of taste and odor. These tests, however, did indicate that the samples in which the oat flour had been used in the original salting, and then repacked in brine without the use of the flour, were in considerably better condition than the control samples which had been packed without the flour at any stage. It will be noted from Table I that samples 2, 3 and 4 after four months had a peroxide number of 2.5, 2.0, and 2.0, which is by far the lowest of any of the other results shown in this table. These samples were the only ones in which the flour had been omitted in the repacking operation.

When it was realized that it would be impossible to continue the use of the peroxide value as an indicator of rancidity, it was necessary to devise other means for evaluating this quality. It was decided to make the tests by actual cooking and eating of the fish. In making a test of this kind

(*Turn to page 583*)

TABLE II—Tests Made After Five Months' Storage

Test number	Observer	Preference	Rancidity
		Samples 1 and 2 tested	
a	A	2 (pronounced)	2 is not rancid and has normal flavor. 1 is rancid and has bad aftertaste.
	B	2 (pronounced)	2 had fresh flavor but with a slight foreign but not unpleasant flavor. 1 is rancid and leaves a pronounced aftertaste.
		Samples 1 and 3 tested	
b	B	3 (pronounced)	3 is not rancid but has a "sweet" flavor. 1 definitely rancid.
	C	3 (pronounced)	3 has no pronounced aftertaste. 1 has a fishy, pronounced aftertaste.
		Samples 1 and 4 tested	
c	A	4 (pronounced)	4 is not rancid. 1 is slightly rancid.
	B	4 (pronounced)	4 is not rancid and has foreign but not unpleasant flavor. 1 is rancid and leaves an aftertaste.
		Samples 1 and 5 tested	
d	B	5 (very slight)	Both 1 and 5 are rancid. 1 slightly more than 5.
	C	1 (slightly)	Both are rancid. 5 seemed to have more aftertaste.

Tests Made After Six Months' Storage

Test number	Observer	Preference	Rancidity
		Samples 2 and 3 tested	
e	A	3.....	3 has normal flavor. 2 has slight astringent aftertaste
	B	3.....	3 has fresh flavor. 2 has slight aftertaste.
	C	3.....	3 has a very slight oat flour flavor but is otherwise good. 2 has a slight astringent aftertaste.
		Samples 2 and 4 tested	
	A	2.....	2 has no off-flavor. 4 has slight off-flavor.
	B	2.....	2 has somewhat characteristic fish flavor. 4 has slight off-flavor and some oat flour flavor.
		Samples 1 and 2 tested	
g	A	2 (pronounced)	1 is rancid — extremely bad flavor — terrible aftertaste. 2 has fairly good flavor and no marked aftertaste.
	B	2 (pronounced)	1 has astringent off-fatty taste giving a very sharp taste in the throat. 2 has good flavor — no aftertaste.
	C	2.....	1 has undesirable taste. 2 is much superior in taste.

Tests Made After Seven Months' Storage

		Samples 1 and 2 tested	
h	A	2.....	1 is extremely rancid and has bad flavor. 2 is perfectly edible and has a slight rancid flavor; a faint oat flour flavor was detected.
	B	2.....	1 is very rancid. 2 is good.
		Samples 1 and 3 tested	
i	A	3.....	3 has smooth, fine flavor. 1 is rancid.
	B	3.....	3 was very slightly rancid and had fairly strong oat flour taste. 1 showed pronounced rancidity with some aftertaste.
	C	1.....	3 had aftertaste and oat flour taste. 1 had a little rancidity.
		Samples 1 and 4 tested	
j	A	4.....	4 had normal taste except for a fairly strong oat flour taste. 1 is rancid though not as much as usually.
	B	4.....	4 has mellow, normal flavor with some oat flour taste. 1 has fishy strong taste.
	C	.....	Failed to qualify.

TABLE III—Conclusion

Test No.	Composition of Treatment	Conclusions
After five months' storage		
a	1 2 Control vs 15% Avenex #3 in brine.....	2 much better
b	1 3 Control vs 30% Avenex #3 in salt.....	3 much better
c	1 4 Control vs 10% Avenex #3 in salt.....	4 much better
d	1 5 Control vs 10% Avenex #3 in salt then repacked with 5% Avenex #4.....	No difference
After six months' storage		
e	2 3 15% Avenex #3 in brine vs 30% Avenex #3 in salt....	3 somewhat better
f	2 4 15% Avenex #3 in brine vs 10% Avenex #3 in salt....	2 somewhat better
g	1 2 Control vs 15% Avenex #3 in brine.....	2 much better
After seven months' storage		
h	1 2 Control vs 15% Avenex #3 in brine.....	2 much better
i	1 3 Control vs 30% Avenex #3 in salt.....	3 better
j	1 4 Control vs 10% Avenex #3 in salt.....	4 much better

REFERENCES

[1] Dahle, C. D., and Josephson, D. V., *Ice Cream Field*, May, 1937.
[2] Musher, S., FOOD INDUSTRIES, July, 1935.
[3] Peters, F. N., and Musher, S., *Ind. and Eng. Chem.* 29, 146, 1937.
[4] Musher, S., U. S. Patent 2,026,697 (Jan. 7, 1936).
[5] Ibid., 2,029.248 (Jan. 28, 1936).
[6] Wheeler, D. H., *Oil and Soap*, 9, 89, 1932.

QUICK-FREEZING QUALITY in Poultry

Close control and careful processing produce a standardized excellence which is preserved for the customer by quick freezing.

UNTIL THE ADVENT OF QUICK FREEZING, consumers in large metropolitan areas had to take their poultry as they found it. And many found it several degrees off flavor as compared with that which Uncle Henry served on the farm. But now the picture is different. Poultry standardized to a quality level unheard of a few years back is available in attractive, sanitary packages, all cleaned and ready to cook, at prices very little, if any, higher than paid for ordinary semidressed poultry at the corner meat market.

The means by which the high quality is attained and protected in this quick-frozen poultry represents principles of quality control that have a place in every food-processing industry. As carried out by Frosted Foods Sales Corp., New York, in the production of its Birds Eye quick-frozen poultry, quality control begins with the selection of birds on the farm or at the plant receiving platform. Then close control is applied all the way through the processing operations, even unto periodic examination of the finished product by field-laboratory scientists.

Birds Eye poultry is prepared and quick-frozen in the plants of Sherman White Packing Co., Fort Wayne, Ind., and of Jerpe Commission Co., Omaha, the work being done on a contract basis and under quality standards set by Frosted Foods Sales Corp. Both of these plants are located in the heart of poultry-producing regions, so that there is available an ample supply of high-quality chickens, turkeys and ducks, permitting selection of a high-grade of raw material. Furthermore, the plants are sufficiently close to the sources of supply that the live poultry need not be trucked over great distances, with consequent deterioration in quality, before reaching the plant.

Since the operations in both of the plants which quick-freeze poultry for Birds Eye are much the same, only one plant will be considered in this article, that at Fort Wayne. Sherman White Packing Co. obtains its supply of poultry not only from Indiana, but from the surrounding states, including Michigan, Ohio, Illinois and Kentucky, with some arriving from Wisconsin. The poultry comes in by truck to the plant receiving platform, where it is graded before being put into feeding pens for fattening. This selection of the live birds is the first important step in quality control, but it is not the last point at which undesirable birds are culled out. As with most animals, judging quality on the hoof is subject to miscalculation, so any mistakes are corrected at a later grading after the birds have been killed and plucked.

In the feeding pens, located on an upper floor of the plant, the live birds are kept from four to ten days, during which time they are fed special fattening rations twice daily. The pens are small, with several chickens being kept in each so that they have no room to run and consequently fatten rapidly.

The raw material thus having been "polished up" preparatory to processing, the chickens are taken at the end of the feeding period to the killing

▶ ***Lasting business is being built in the food industries these days with products standardized to a high quality—with products which the housewife finds just as excellent next week or next month as they are today and every package of which is up to requirements. The means by which this uniform and continuous quality is obtained in quick-frozen poultry incorporate ideas for***

All Food Processors

department. Here they are suspended by the feet from an overhead chain conveyor and are carried to the point where their throats are cut and they are bled. Continuing on the same conveyor, the birds pass from the bleeding operation through a scalding tank, containing water at 120 deg. F., to loosen the feathers. Then they go to a vat containing a paraffin-base wax in the molten state. The conveyor dips to lower the poultry into this wax and then raises back to the normal level and passes through a water spray which cools and sets the wax on the feathers. Leaving the spray chamber, the poultry is carried before a line of girls who strip off the feathers, the hardened wax coating making this a rapid and easy operation. Farther along the same conveyor, girls remove any feathers which escaped the stripping operation by plucking and by singeing with a gas flame. The dressed birds are then hung on portable racks where the heads are wrapped in paper and the rack-full taken to a chill room. Only a few minutes elapse between the killing of the bird and its delivery to the chill room where the animal heat is removed at a temperature slightly above 32 deg. F. This means that there is little chance for deterioration in quality before the poultry goes under refrigeration.

After chilling over night, and before further processing, the poultry is graded in the chill room according to size and quality. This is done with the aid of a three-shelf sorting bin, the top grade going on the top shelf, the second grade on the middle shelf and the third grade on the bottom shelf, with the sizes in each grade being separated in different compartments on each of the three shelves.

Of utmost importance in the quality control exercised over the Birds Eye frosted poultry is the fact that only the birds on the top shelf are placed into the chute leading from the chill room to the Birds Eye quick-freezing department. Arriving at the bottom of this chute, the birds are transferred to a stainless-steel belt along which about ten girls work. These girls examine the chickens carefully and remove every feather or bit of foreign material, the birds being suspended by the feet for this operation. Then the poultry is transferred into the stainless-steel pans of an endless conveyor which passes before a government inspector. Standing just ahead of the inspector is a man who cuts open each bird, and there is also a woman who spreads the split carcass wide apart so that the inspector may see the viscera. Inspecting the poultry carefully for disease, the inspector throws any condemned birds into a special container provided for that purpose and pours a disinfectant over them. These birds, of course, are not used for food. To provide against contamination of the carcasses of healthy birds which might be put into a pan that had contained a carcass that was condemned, the inspection conveyor is sterilized by hot water and steam as it passes underneath the rollers on its return travel.

ANY BIRD that has progressed to the end of the inspection belt without being placed among the culls or condemned stock is considered of sufficiently high quality to carry the Birds Eye label, and from here on the operations are those necessary to prepare it for freezing. But that does not mean that quality control is relaxed. Far from it. There are frequent inspections until the product is packaged to see that the eviscerating and washing operations have been thoroughly done.

After leaving the inspection belt, the poultry is taken by a girl who wields a cleaver to loosen the feet and heads, a cut being made at the base of the neck so that it may be severed from the body and wrapped separately with the hearts, livers and gizzards. Then the carcasses are placed in pans on another stainless-steel belt, there being about ten girls working on each side of this conveyor. Some time during its travel along the conveyor, each bird is removed, placed on a stainless-steel table and eviscerated, the viscera being dropped into the chute leading to a viscera container. The gizzard is also cleaned at this point, then the carcass, together with the hearts, livers, gizzards and necks, is placed back into a pan of the conveyor to be carried to the washing operation.

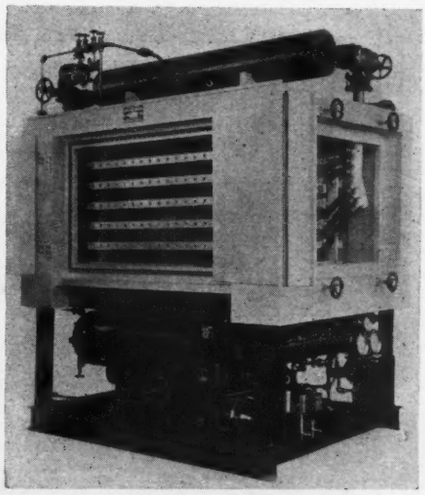

Plate-type freezer used for quick-freezing Birds Eye poultry.

Each table on which the viscera is removed is flushed with a constant stream of water to keep it clean, and the pans of the conveyor are thoroughly cleansed on their return travel.

Arriving at the end of the eviscerating conveyor, the birds are taken from the pans by a girl who hands them to two operators who wash the carcasses thoroughly inside and out under high-pressure sprays, the hearts, livers and gizzards being placed in containers and passed to two other operators for thorough inspection and washing. Following the cleansing operation, the carcasses are freed of excess water in a centrifuge of the type used in a laundry to dry clothes, then each carcass is opened up, inspected carefully to see if any bits of viscera have been overlooked and blotted with a clean absorbent cloth to dry it more thoroughly. After the hearts, livers and gizzards are washed and inspected, they are wrapped in waxed paper, later to be inserted inside the carcass of a bird and the whole weighed. There being no waste in this poultry, exact weight is important, so the birds are weighed to a fraction of an ounce and the weight recorded on a slip which is placed with the bird. Upon this slip the cost to the consumer is based when the sale is made at the retail store.

There remains but one other step in the preparation of the poultry for freezing—packaging. After being weighed, each carcass is neatly wrapped in transparent cellulose and then put into a stockinet to hold the wrapper snugly in place during the quick-freezing operation. The birds are then sorted according to size, with the aid of a three-compartment sorting bin, and packed in waxed-cardboard cartons. In the case of chickens, twelve are put into a carton, different sizes of boxes being used to accommodate the variation in the size of the birds.

Now the Birds Eye poultry is ready for quick-freezing, and for this oper-

(Turn to page 612)

FRUIT JUICE CANNING

A new industry grows rapidly through adoption of better production methods

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▶ ***The thing we like particularly about this article is the food engineering approach to the problems of producing fruit juices. Note the Table of Unit Operations involved and how the fruit-juice industry has employed new methods and equipment from the other fields, even to crushing by means of the hammer mill. This open-minded approach should be an example to***

All Food Manufacturers

THE PRODUCTION OF FRUIT JUICES has greatly increased during recent years, accompanied by a change in the relative importance of the juices and a marked change in their packaging. Pineapple and tomato juice have largely displaced apple and grape juice in extent of production. Cans have largely replaced bottles, and still juices have become more popular than the carbonated. The annual production of canned juice for which statistics are available is given in Fig. 1.

The expansion of the market for fruit juices was due in part to the effective advertising of the citrus industry, which popularized the drinking of orange juice at breakfast. However, the improvement in the quality of the finished product and the perfecting of suitable can enamels have also had a great influence on the present development. American consumers are more juice conscious today than ever before and are more receptive to new fruit juices. Thus they have received favorably such juices as apricot and prune which have been marketed recently, although these juices were not favorably received by the trade when they were introduced several years ago.

A recent survey has shown that most of the fruit juices served in the home are used at breakfast, the next largest use being as a between-meals drink, especially for children. The use of juice in beverages such as punches and ades and in mixed drinks was least important in the home. However, certain prepared juices, such as lemon juice, are used largely for mixed drinks and in bakery products. The common use of fruit juices at breakfast has resulted in the increased production of still and somewhat tart juices rather than carbonated fruit-juice beverages so popular less than a decade ago.

The most important problem in preparation and preservation of fruit juices is that of retaining in the finished product as much as possible of the pleasing qualities of the fresh juice. Any fruit juice is best when it is first pressed from the sound fresh fruit, and any treatment that may be given to it thereafter usually injures its delicate flavor and aroma. Appearance of the juice can be improved, as by making it clearer, but the natural flavor cannot be improved. Second only to the retention of flavor and color is the retention of nutritive value. Fruit juices are often included in the diet of growing children as a source of vitamin C, and this must not be destroyed.

The nature of the fruit, the method of extracting the juice, as well as the method of preparing and preserving the juice, influence its quality. Not all fruits are suitable for juice-making, and not all varieties of the juice-fruits are equally desirable. The variety of the fruit used, the locality and conditions under which it is grown and its maturity and condition when used have a marked effect, not only on its initial flavor, but also on its keeping quality. The best juice can be made only when freshly picked sound fruit, of a suitable variety and at its optimum maturity, is used. Good juice cannot be made from moldy, decayed or split fruit; but off-size, blemished or sound fruit otherwise unsalable may be used.

Structure and composition of the fruit should be considered in choosing the method of extracting the juice. Among the more important factors that are involved are: the mode of occurrence of the juice in the fruit, whether in localized areas or in elements uniformly distributed throughout the fruit; whether in easily ruptured juice cells or in cells surrounded by mucilaginous or gummy substances; the presence of undesirable constituents such as bitter glucosides, astringent tannins, objectionable oils and enzymes in localized tissues; the location of desirable constituents such as color pigments and flavoring substances; and the rigidity of the struc-

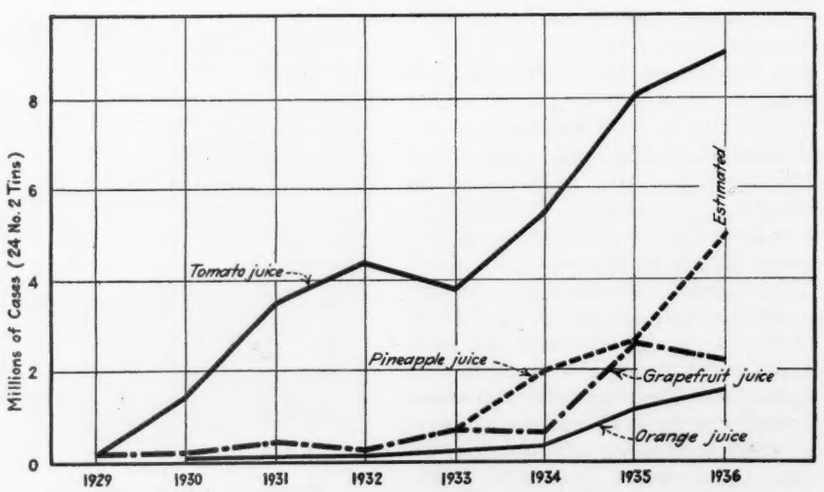


Fig. 1—Changes in consumption of fruit juices.

tures surrounding the juice tissues. In general, the juice is contained within the cells or in juice sacs and does not come in contact with the various tissues that go to make up the remainder of the fruit structure. During the extraction of the juice, the various tissues are broken and the juice is mixed with them and, as a result, it may absorb the undesirable products which these contain. Furthermore, fluid containing undesirable elements may be pressed out of the tissues surrounding the juice sacs. Therefore, the juice should be extracted by methods which result in the minimum of contamination with undesirable constituents present in the tissues surrounding the juice cells.

Although in general the processes used for the preparation and preservation of fruit juices are similar, they differ in detail, depending upon the type of fruit used. Some fruits are heated whole before crushing to destroy the rapidly acting enzymes present in the tissues, other fruits are heated after crushing for the purpose of color extraction and as an aid to pressing; some fruits are pressed whole, others after crushing in graters, hammer mills, or other suitable devices, and some are especially prepared for extraction in a specially devised apparatus.

The extracted juice may be merely strained in a rotary perforated cylindrical screen or by passage through a suitably constructed expeller press; or it may be filtered after clarification by fining, heating or freezing; or it may be subjected to cold storage or a freezing process for the removal of cream of tartar. Great advances have been made in the development and design of apparatus for the automatic processing of fruit juices, which are typified by the development of automatic juice-extraction units, of which there are now some four types for citrus juices and three types for other fruit juices. Also crushing has been perfected and put to use in the juice industry—for example, the hammer mill for crushing apples, the rotary centrifugal mill for crushing other materials including tomato and apricot pulps. Yet, in spite of these advances, much remains to be done in this field.

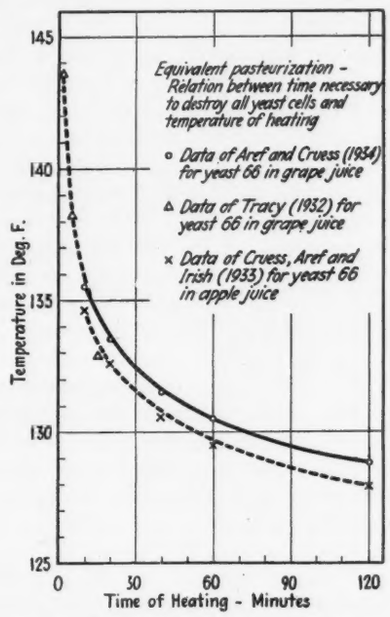

Equivalent pasteurization - Relation between time necessary to destroy all yeast cells and temperature of heating
o Data of Aref and Cruess (1934) for yeast 66 in grape juice
Δ Data of Tracy (1932) for yeast 66 in grape juice
× Data of Cruess, Aref and Irish (1933) for yeast 66 in apple juice
Temperature in Deg. F.
Time of Heating - Minutes
145
140
135
130
125
0
30
60
90
120

Fig. 3—Equivalent pasteurization times and temperatures. Data from which these curves were drawn may be found as follows: H. Aref and W. V. Cruess: An Investigation of Thermal Death Point of *Saccharomyces ellipsoideus*, *Journal of Bacteriology*, 27, 443-452, 1934; W. V. Cruess, H. Aref and J. H. Irish: Pasteurization Investigations, *Fruit Products Journal*, 12, 358-359, 1933; Ralph L. Tracy: Lethal Effect of Alternating Current on Yeast Cells, Journal of Bacteriology 24, 423-438, 1932.

Table I — Unit Operations Required in Production of Five Fruit Juices.

Unit Operation	Materials and Equipment Used	Apple	Berries	Citrus	Grape	Tomato
WASHING						
	Water	x	x	x		
	1% Hydrochloric acid soln.	x				
	Hypochlorite solution			x		
SORTING		x	x	x		x
GRADING				x		x
HEATING IN STEAM						x
EXTRACTION						
	Halving			x		
	Peeling			x		
	Crushing					
	Grater	x				
	Hammer mill	x				
	Crushing and stemming				x	
	Heating				x	
	Pressing				(Red only)	
	Continuous expeller		x	x		x
	Rack and cloth	x			x	
	Basket	x			x	
	Burring					
	Hand			x		
	Automatic machines			x		
CLEARING						
	Straining			x		x
	Pining agents					
	Heat	x	x		x	
	Freezing				x	
	Filtration	x	x		x	
	Enzymes	x				
DEAERATION		x	x	x	x	x
PASTEURIZATION						
	Flash	x	x	x	x	
	In the can	x	x	x	x	x
CANNING						
	Filling					
	Cold	x	x	x	x	
	Hot	x	x	x	x	x
	Cans					
	Plain	x		x	x	x
	Enamel		x	x		
	Sealing					
	At atmos. pressure	x	x	x	x	x
	Under vacuum	x	x	x	x	x
COOLING		x	x	x	x	
COOL STORAGE				x		

Not only the method of extraction but also the manner in which it is employed is important. It is well known that exposure of citrus juices to air results in considerable changes in flavor and color, and recent experience has demonstrated the undesirability of exposing other and more stable fruit juices, e.g., apple and grape, to air either during extraction or subsequent handling. The removal of air incorporated during extraction or subsequent treatment by holding the product under high vacuum is necessary, not only for the more complete retention of flavor but also for the retention of those vitamins subject to destruction by oxidation, e.g., vitamin C.

Contamination of the juices with metals, particularly iron and copper, absorbed during extraction, clearing

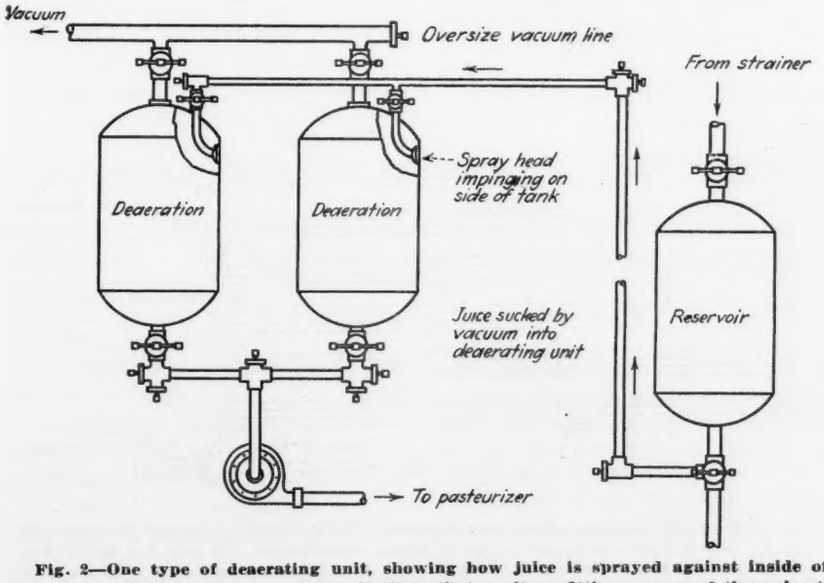


Fig. 2—One type of deaerating unit, showing how juice is sprayed against inside of tank in a high vacuum to remove air. Note that sanitary fittings are used throughout.

or processing, is to be avoided also. These metals not only give the juice an objectionable metallic flavor but hasten oxidative changes as well and may produce objectionable precipitates such as iron tannates. Corrosion-resistant materials should be used for all equipment coming in contact with the juice during extraction and processing.

The clearing of fruit juices, either mechanically as by filtration, or chemically as by the use of fining agents, is another important factor in flavor retention. While the improvement in appearance by removal of the coarse particles of pulp and the seeds and other tissue fragments is desirable, complete clarification often adversely affects the flavor and color of the juice. It is well known that juices completely freed of suspended material are more stable. This fact, in addition to the wide use of glass containers for juices, was probably responsible for the former widespread practice of filtering or clarification. However, much of the flavor and the color of fruit juices such as orange and tomato juice is contained in the suspended material, the removal of which would detract from the appearance and flavor of the product. It has long been customary to market citrus juices in the cloudy condition, and with the advent of suitably lined cans this practice has extended to the other major fruit juices. Nevertheless, the amount of pulp to be left in the juice depends on the one hand on its content of enzymes and other undesirable constituents and on the other hand on the presence of coloring and flavoring bodies. It is not easy to strike a proper balance which would result in the retention of the minimum of those agencies responsible for off-flavors and losses in color and the maximum of the desirable color- and flavor-bearing bodies.

Fruit juices in general, and citrus juices in particular, deteriorate in color and flavor on exposure to air, particularly during heating and storage. Even the more stable juices, such as apple and grape, lose much of their fresh aroma, become cloudy and discolor in the presence of air. For this reason it is desirable to minimize the exposure of the juice to air during extraction, straining and other treatment. Because of the presence of air in the intercellular spaces of the fruit and because of the difficulty of extracting the juice without some aeration, the extracted juice usually contains appreciable quantities of oxygen. Much of this oxyen is present on the surfaces of the fruit particles, some of it is dissolved by the juice, and at first only a small portion is fixed by the constituents of the juice in the form of peroxides. Therefore, if the juice, soon after extraction, is subjected to a high vacuum, a great deal of the oxygen, as well as other gases, may be removed before it has become fixed by the juice. The deaeration is best accomplished by drawing the strained juice into an evacuated vat or tank so constructed that the juice is sprayed into it in a fine mist or as a thin film. (See Fig. 2.) After partly filling the vat, the juice is held under a vacuum of at least 27 in. for about 10 minutes. Then the vacuum may be relieved, preferably with an inert gas such as nitrogen, or with air. Since much of the gas is present on the fruit particles and these become soaked with juice on losing their gas during vacuumization, the reabsorption of air by deaerated juice is small. Usually, the deaerating unit is so connected with the pasteurizing unit that the juice does not come in contact with air until it issues hot from the pasteurizer into the filter. The blanket of steam over the juice then further protects it from oxidation.

FINALLY, the activity of the agencies responsible for the spoiling of the juice, particularly the micro-organism and the enzymes, should be inhibited with the minimum effect on flavor.

Heating the juice to a temperature and for a time sufficient to destroy those micro-organisms capable of growing in the juice is the most important method of preserving the juice. However, pasteurization must be carried out under conditions that will not impair the flavor of the fruit juice. Too high a temperature of pasteurizing, or too long a period of heating, impairs the fresh fruit flavor and imparts a cooked taste. To overcome this objection, two processes of pasteurization have been developed: 1. low temperature heating for relatively long periods; or 2. heating for a very short period, about one minute, at high temperature. It is well known that the higher the temperature of heating the shorter is the time necessary to destroy the microorganisms or enzymes, as shown in Fig. 3.

IN THE FLASH pasteurization process, the juice is heated rapidly to temperatures of 190 deg. F., held there for about a minute, cooled to a suitable filling temperature, filled into containers which are then closed, inverted to sterilize the seal and promptly cooled. To avoid overheating, the juice must be brought rapidly to the pasteurizing temperature and then promptly cooled so that it is exposed to high temperatures for but a short interval. This process in conjunction with deaeration is finding favor, not only in the citrus-fruit-juice industry for which it was chiefly developed, but also for other fruit juices. Flash pasteurization is generally accomplished by passing the juice through a tubular heat exchanger in which it is heated by steam or hot water and then cooled to filling temperatures. (See Fig. 4.)

The juice is filled hot into the cans at about 175 deg. F. The cans are then sealed automatically, inverted to sterilize the lids and then promptly cooled by rotating through a chilled-water bath. Citrus-enamel-lined cans are used for citrus juice, and special berry-enamel-lined cans for logan-

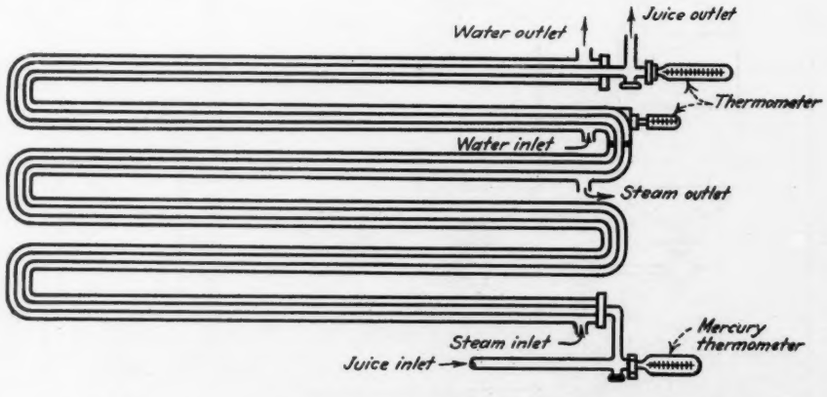


Fig. 4—Schematic diagram of tubular heater and cooler. Juice is heated to about 195 deg. F. in first four passes and cooled to filling temperature (175 deg. F.) in the last two passes. Either steam or hot water is used as the heating medium. If steam flow is reduced to a mere trickle the medium is really hot water (condensate).

berry and red grape juice or other colored juices. However, not all the bleaching action of the tin plate is prevented even in these cans, and colored juices should not be stored too long or at too high temperatures.

The light-colored juices may be packed in unlacquered cans under some conditions. The fresh fruit flavor of the juices is often better preserved in an unlined tin can, but there is danger that the juice will acquire a "tinny" flavor. Probably a partially lined tin can may be best, one that combines the flavor-protective effect of tin without imparting its tinny flavor. Packing orange juice in citrus-enamel-lined cans having plain tin lids may be desirable.

Although the deaeration – flash pasteurization process is generally applicable, it is not universally used at present. This is due not only to the fact that it has been brought to its present perfection only during the last few years, but also because of the stability of some of the juices and the peculiar nature of the bacterial spoilage of others. Thus, for example, fruit juices such as those prepared from apricot and prunes, are quite stable and do not need to be flash-pasteurized. On the other hand, the spoilage of tomato juice has been found to be due to a fairly heat resistant bacteria, so that the canners feel safer in processing this juice in the can.

When the latter process of pasteurization is used, the juice is filled cold into cans which are then usually closed under vacuum and processed in an agitating hot-water bath for the required period of time. Even in this method precautions should be taken to avoid overheating by promptly cooling the cans of processed juice.

The favorable reception given to beverages made from dried prunes and from mealy fruit such as apricots has an important significance to the canner because the packing of such items will lengthen the operating season and thus decrease the unit overhead costs. The beverages made from apricots consist essentially of a mixture of pulped fruit and syrup. A similar process may be used for the production of suitable beverages from other pulpy fruits. The prune juice is made by leaching dried prunes with hot or boiling water and then standardizing the resulting extract to a given sugar content. Other fruit in season may be converted into a salable juice beverage.

Since heating merely destroys the

Fig. 5—Types of tubular heat exchangers showing increased efficiency as measured by the heating area per unit of volume. The juice area is the shaded portion.

microorganisms and enzymes capable of spoiling the juice but does not prevent chemical changes, the canned juice is usually not imperishable. Reactions of the constituents of the juice with each other or with the container result in changes in flavor that may be quite appreciable on certain conditions. For this reason, it is desirable that canned fruit juices be not subjected to high temperatures for too long a period. Cool storage and preferably cold storage is desirable. Proper storage will not only minimize the changes in flavor brought about by uncontrollable agencies but also by the controlled agencies. Thus, if the enzymes are only partially inactivated by the heat treatment used, the juice may be marketable over a longer period of time. Too little attention has been given to this matter in the past, but with greater emphasis being paid to flavor retention this will become increasingly more important.

Oat Flour Improves Keeping Quality of Fatty Fish

(*Continued from page 577*)

the samples were soaked in fresh water for approximately twelve hours and then broiled. All samples were handled in as nearly the same manner as possible. They were then tasted by several different prsons who did not know the treated from the untreated samples. Tasters who could not consistently distinguish between the samples were disqualified. Those observers who were finally qualified were required to state the reasons for their preference. These reasons are set forth in Table II.

The tests were continued over a ten-month period.

With regard to the salt-mackerel fillets packed in glass, all of the treated samples had a pleasing appearance with the exception of where the fish were stuck together and the flour settled out between them. They were exceptionally attractive and of a superior color as compared with the untreated which showed the usual rancidity and discoloration.

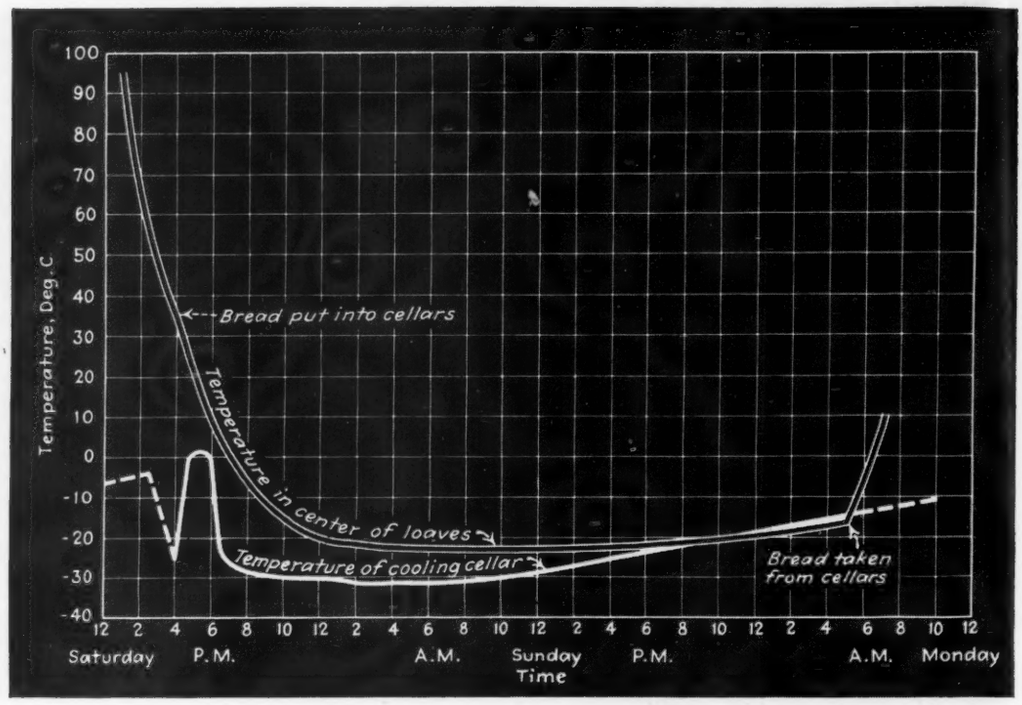
With regard to the split mackerel, in Table III are set forth in a condensed form the conclusions reached. These results indicate that when the oat flour is to be effective for salt mackerel, it should be added during the first salting operation and should be omitted when repacking the fish. This repacking operation should be done as soon as possible: that is, the fish should be removed from the original brine containing the oat flour and packed in a fresh brine not containing oat flour as soon as they are completely struck.

The treated samples show considerable improvement over those packed in the ordinary commercial manner. After a period of six months, the treated samples show very little rancidity and are in excellent condition as to appearance and flavor, while the untreated samples show the development of rancidity in a marked degree, and a distinct objectionable "aftertaste" or "repeating" is observed.

The most noticeable improvement was observed in those samples to which was added 30 per cent Avenex No. 3, based on the weight of the salt used. The samples in which 15 per cent Avenex No. 3 was added to the brine into which the mackerel were initially dipped were in very good condition, but they were considered slightly inferior to those of the 30 per cent group. The least beneficial treatment was that in which the fish were salted with 15 per cent Avenex No. 3, based on the weight of the salt. All of the above oat flour treatments are considered good, and while the difference between them is noticeable, the range is quite small.

The treated mackerel samples were also compared with regular samples of commercial mackerel purchased at Washington, D. C., and Gloucester, Mass. In all cases the commercial samples showed distinct rancidity, whereas the treated samples were sweet and free from objectionable flavor.

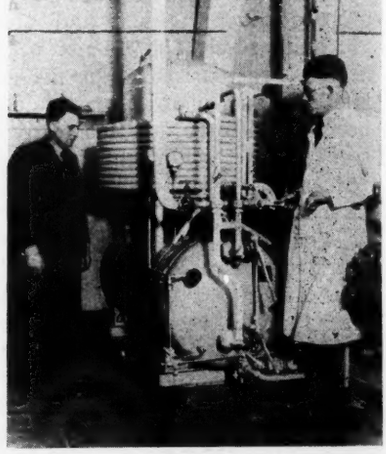
The general conclusions reached are therefore as follows: 1. Mackerel should not be repacked with oat flour. 2. A desirable improvement in keeping quality is observed when oat flour is used during the first curing operation as described under processes Nos. 3, 2 and 4, and given in the order of improvement observed, with process No. 3 best, No. 2 next best and No. 4 next.



Variations of bread and freezing-vault temperatures over different time periods in bread freezing experiment at Van der Meer & Schoep bakery in Rotterdam.

Rotterdam Experiments with BREAD FREEZING

Dutch baker develops method for using freezing temperatures to preserve freshness in bread. Loaves remain fresh after two weeks.



Refrigeration equipment used in bread-freezing experiment.

By H. J. ONNES

Managing Director, Blaauwhoedenveem-Vriesseveem, N. V. Rotterdam, The Netherlands.

SUPPLYING FRESH BREAD in Holland is made difficult by labor regulations governing the working hours in bakeries. To prevent night work, the law prohibits the sale of newly baked bread before 10 o'clock in the morning. But the Dutch people want their fresh bread long before that time, particularly in those families where lunches are put up for workers or school children. The objectionable condition brought about by this regulation gives most trouble on Monday mornings, when there is a heavy demand for new bread—that kept over from Saturday is stale. In spite of this difficulty and the protests it has caused, the government has not been willing to withdraw its restrictions on the sale of newly baked bread.

This situation caused the Van der Meer & Schoep bakery in Rotterdam to try freezing bread as a means of holding it in fresh condition until its sale.

Staling of bread results from a complex change in the bread itself. One of the significant changes associated with staling is drying of the loaf with the development of crumbiness—a loss of the velvety texture of the crumb and of the tender crispness of the crust.

It has been known for some time that these changes in bread can be greatly lessened if the bread is kept at a low enough temperature. But when this discovery was made, the technic of refrigeration application had not been developed to the point where its use for bread preservation was practicable. Now, however, a practicable application appears possible. At least, from a technical standpoint, freshness has been retained in bread at Rotterdam by freezing.

Van der Meer & Schoep has available refrigeration apparatus of the

ammonia-absorption type with capacity enough to cool two freezing vaults of 2.5 c.m. (88.3 cu.ft.) capacity each to a temperature of from —30 to —40 deg. C. (—22 to —40 deg. F.).

The following procedure was followed in the bread-freezing test:

At 1 p.m. 600 loaves of freshly baked bread were set aside to cool. This bread, as it came from the oven had a temperature slightly less than that of water boiling at 100 deg. C. (212 deg. F.). After cooling for three hours, the temperature of the loaves was about 35 deg. C. (95 deg. F.). The reason for this preliminary cooling in the air was to reduce the load on the refrigerating system, and thus improve the economy of operation of the freezing process.

Meanwhile the temperature of the freezing vaults was reduced to —25 deg. C. (—13 deg. F.).

The bread, after the preliminary cooling period was finished, was placed on metal racks and lowered into the freezing vaults through doors in the top. This method of charging the vaults kept loss of cold to the minimum. When the bottom of a vault was covered with a layer of bread, the bread was covered with finely crushed solid carbon dioxide. The purpose of this was to produce an atmosphere of CO_2 in the vault as an aid in retarding the staling of the bread. The quantity of CO_2 used was 5 per cent of the weight of the bread (50 grams to each 1,000 grams of bread; 50 lb. for each 1,000 lb. of bread).

As the vault was filled with bread, its temperature rose to a point above freezing. But two hours after the filling was completed and the door closed, the operation of the refrigerating system and vaporizing of the solid CO_2 lowered the vault temperature to —20 deg. C. (—4 deg. F.). The variations of temperature in the vault and in the center of a loaf of bread stored in the vault, with different periods of freezing, are shown in the accompanying chart.

Reference to the chart shows that after five hours the temperature in the center of the loaves had been lowered to —20 deg. C. (—4 deg F.).

At this temperature, the frozen bread will remain unchanged for long periods. Bread was sold after being held in the vaults for two weeks, and it was unchanged from its original fresh condition. However, in most cases, the bread was held at the low temperature only for periods up to 30 hours. When the bread was removed from the vaults, it was frozen hard. A period of about two hours in a warm and humid atmosphere was required to bring it into condition for consumption.

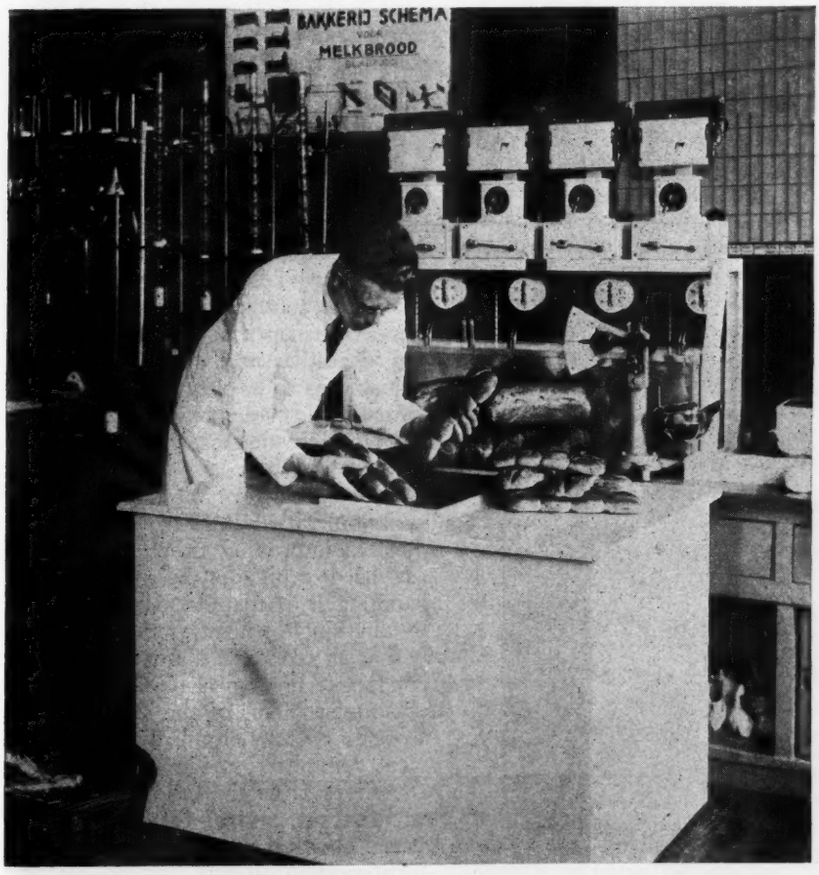
The question has been raised as to whether or not bread, treated in this manner, is equal to freshly baked bread. We found that bread so treated was in about the same condition as bread eight hours out of the oven.

This condition can be explained as follows: The bread first cooled in the atmosphere for three hours. Then, between two and three hours were required to complete the freezing, and finally, another two or three hours were needed to bring it to the right temperature for use; a total of eight to nine hours that the bread was not in a fully frozen state. The staling action appears to be fully stopped as long as the bread is actually frozen.

Daily costs for the bread-freezing operation for 600 loaves, per day, were:

Wages for attendance of boiler, refrigerating apparatus and vaults (night and morning)	3.20	florins
Coal	1.00	"
Solid CO_2	6.25	"
Depreciation	2.00	"
Distribution to 65 retail shops	6.75	"
	19.20	florins

The experiment was successful as far as the quality of bread was concerned, but the extra cost made the operation uneconomic under existing conditions. An extra cost of 19.20 florins on 600 loaves, 0.032 florins (1¼ cents) per loaf, was more than our market conditions would permit. For this reason, freezing bread in this way was discontinued.



Removing frozen bread from experimental freezing unit.

Ever since the first loaf was baked, staling has been a problem. Refrigeration is one of the oldest means of extending the merchantable life of a perishable food, but only within the last few years have bakers attempted to apply it to their age-old problem. In this there seems to be a moral. That is, one food industry can often find a solution to its oldest or most perplexing problems in the unit operations or processes employed in another industry as a standard practice.

How a Whole Industry Controls QUALITY

Education of producer and distributor, together with plant and product inspection and technological research are producing a better product in the dried fruit industry.

By **WALTER S. RICHERT**
Consultant on Dried Fruits
Berkeley, Calif.

THE QUALITY OF ANY PRODUCT depends upon its original condition and the treatment it subsequently receives. Any attempt to improve the quality of dried fruit must arise largely through improvements in the methods of handling it. To understand better the nature of such possible improvements we will first review the general technical operations of the industry.

Dried fruits are classified into two groups: "cut" fruits, and whole fruit. Cut fruits, of which apricots, peaches and pears are examples, are prepared by cutting the fully ripe fruit into halves, spreading it in single layers on trays, exposing it to the fumes of burning sulphur to preserve its desirable characteristics and then spreading it in the sun to dry. In the drying operation the moisture content is reduced from nearly 80 per cent to about 16 or 18 per cent. When fully dried, the fruit is boxed and delivered to a nearby packing plant. There it is graded and held in storage until a sale for it has been made, when it is removed from the storage bins and processed. The processing operation consists mainly in washing the fruit well in warm water, and then again exposing it to sulphur fumes for a short time to maintain its naturally brilliant color. After the sulphuring, the fruit is hand-sorted to remove defective pieces and packed in suitable containers, generally 25-lb. boxes.

Raisins and prunes are the principal examples of whole fruits. Prunes are harvested when fully ripe, given a few seconds' dip in hot lye solution to "check" the skins, rinsed in clean water and then dried either in the sun or by artificial heat. After drying, the prunes are allowed to "sweat" in small bins for a few days to equalize their moisture content. Then they are delivered to the packing house.

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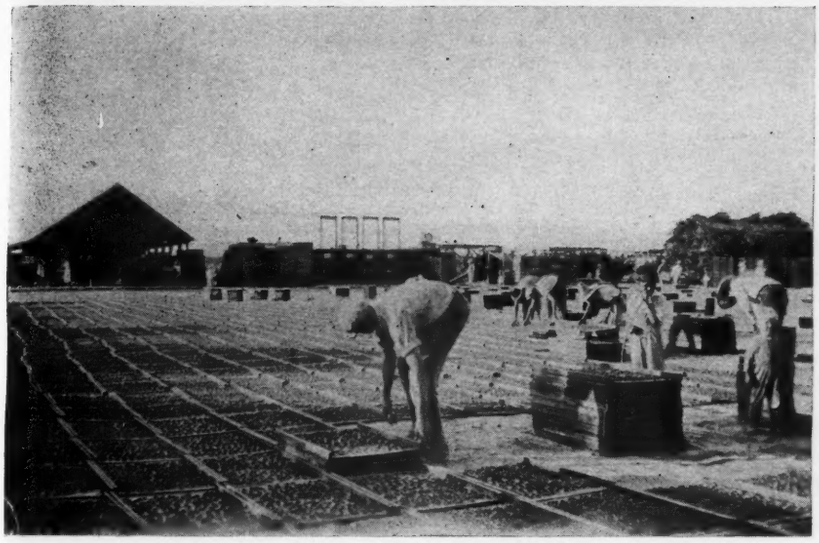
Prunes being dipped in hot lye for a few seconds and then rinsed in clean water before drying.

The processing operation for this fruit is quite simple. After removal from storage, it is washed lightly and then given a dip in boiling water or steam for a few minutes. The purposes of this treatment are to wash the fruit, make it more edible by softening it and destroy any insects or micro-organisms that may be present. The prunes are then packed either in cartons or in 25-lb. boxes. Some brands of the fruit are made additionally tender and more palatable by further treatment with water before processing.

Raisins are produced from grapes picked from the vines directly onto trays on which they are exposed to the sun for approximately two weeks. The dried product is then boxed and delivered to the packing plant, where it is held in storage until it is to be processed and packed. In preparing them for packing, the raisins first pass over a shaker to remove foreign matter, and are then stemmed mechanically. This operation also washes the fruit. Muscat raisins usually are seeded before being packed.

The dried fruit packing industry consists of a number of packers whose function it is to buy the dried fruit from growers, treat it somewhat as outlined above and deliver it through wholesale channels to the consuming public. To establish this competition on a sound basis, and to consider other problems affecting the industry as a whole, the packers are united in a voluntary organization, the Dried Fruit Association of California.

Before the formation of this association, rather little work had been done in improving either the quality of dried fruit or the methods of handling it. Attempts along this line by any single packer would have put him at an economic disadvantage. To conduct technological research on important problems of the industry, the association has organized the technical committee, made up of representatives from the technical staff of each packer, and of the Fruit Products Laboratory at the University of California.



An apricot drying yard, with cutting shed and sulphur houses in background.

The technical committee has fulfilled its function of maintaining the quality of the fruit in the hands of the packer, but the quality of the fruit is determined fundamentally by the grower rather than the packer. So the association has undertaken to educate the growers in the best methods of producing dried fruit. It has organized "field practice" committees throughout the state, whose function it is to offer advice and suggestions to growers as to better and more profitable methods of production and several unfavorable practices have been eliminated as a result of this effort.

Improvements in the quality of dried fruit may thus be divided into two distinct classifications: improvement in quality at the source, which is in the hands of the grower; and improvement through technological advances by the packer. A third factor, the treatment the fruit receives after it leaves the packer and is held by wholesale jobbers or retail merchants, is of importance. Individual measures to improve quality will be considered separately in these three categories.

Quality Improvement by the Grower

Methods of production that are practiced by the growers vary with the different kinds of fruit. Each of these fruits will thus be considered separately in reviewing the steps to improve their quality.

Figs are especially susceptible to two specific types of damage: attack by insects and fungus disease (particularly endosepsis) of the fruit. As early as 1923, the industry took measures to retard this damage by contributing financially to the establishment of a laboratory of the Bureau of Entomology (Department of Agriculture), in the center of the industry, at Fresno, to investigate insects causing damage to dried fruits. This laboratory is still contributing valuable information to the industry in this respect. After some of the causes of damage had been determined, inspection stations were organized (in 1927) to test every lot of fruit produced by the grower. This inspection service is still carried on, and growers are paid for their fruit on the basis of the percentage of perfect fruit in a shipment.

It was found that the causes of damage were too deeply rooted for individual growers to eradicate them successfully. The industry then organized a "fig clean-up" campaign covering a period of two seasons. In this campaign, all trees harboring insects or disease affecting figs (particularly the Calimyrna variety) were carefully treated and in many instances completely eradicated. In addition, advice and equipment were made available to growers to carry this work on further. The expense of this program has proven to be justified, as it resulted in a direct increase of almost one million dollars annually in the value of the fig crop.

Cut Fruit. Work by the industry in improving the quality of cut fruit dates from about 1924. The work has progressed steadily until now there is a corps of workers in the field calling on growers at all times and educating them to the proper methods of curing their fruit.

One of the chief considerations in this respect is the sulphur dioxide content of the fruit. Sulphur dioxide is necessary in these fruits to preserve their naturally high content of vitamins A and C and to maintain other desirable qualities. Although in the amounts used it has no harmful effects, it is desirable to keep the sulphur content as low as is consistent with effectiveness. A special bulletin was prepared and circulated among growers giving specific advice on the best methods of sulphuring and on construction of sulphur houses. Specifically, this bulletin emphasized the following points:

1. The fruit must be fully mature.
2. Best results are obtained when cut fruits are sulphured immediately after cutting. In no event should they stand over one hour.
3. Fruit to be sun-dried should be placed in the sun as soon as possible after sulphuring.
4. Regulating the time of exposure or the amount of sulphur burned is the best way of controlling the amount of sulphur in the dried product.
5. The sulphur house should be built to hold not more than two (preferably one) trucks of fruit. The length should be sufficient to provide a free space of 6 in. more than the diameter of the sulphur pit or pan.
6. The sulphur house must be tight with a tightly fitting door.
7. The drafts and vents must be adjustable.
8. The sulphur house should be placed so that the prevailing winds blow towards but never away from the draft intake.
9. Materials of construction should be such that the sulphur house absorbs a good amount of the heat of the sun; a sulphuring temperature over 100 deg. F. is best.

As a result of the distribution of this bulletin and the personal conversations accompanying it, a reduction of approximately 50 per cent was effected in the average sulphur content of the fruit, which is now held at the minimum that can be used and still preserve all the desirable properties of the fruit.

Until recently it was the standard

▶ ***The place to begin quality control is at the source of the raw material. This the dried fruit industry recognizes, so it tells the growers how to produce better fruit. High quality having been obtained in the raw material, steps are taken to protect it in the plant. Research has improved the technology of the industry, and lastly, distributors are being educated to maintain quality. The basic principles of quality control used in the dried fruit industry are applicable in***

All Food Processing Industries

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practice in one apricot district to harvest the fruit by shaking the trees, allowing the fruit to fall to the ground and then picking it up. Such a procedure contributes to inferior quality in two ways: some green fruit is included, and the ripe fruit is bruised, often picking up dirt. This practice has been almost completely replaced with the standard method of picking fruit by hand.

It was early seen that growers had a tendency to be lax as regards sanitation in the cutting sheds and in the drying yards. As before, a special bulletin was prepared and distributed by the field practice committees, giving instructions and suggestions for eliminating these faults. The necessity for cleanliness both in the dry yards and the cutting sheds was emphasized. The dry yard should be built a good distance away from public roads and other farm buildings to keep dust from blowing over the fruit. The floor should be thoroughly packed down to prevent dust from rising (a growth of bermuda grass or alfalfa is an excellent protective covering), and domestic animals must be kept away. Fruit is best transported around the dry yard on small trucks running on steel rails. This prevents the jolting which might otherwise spill some of the syrup from the fruit.

The chief requirement for cleanliness in the cutting shed is an ample supply of running water. The cutters' hands and the knives and other equipment become sticky and dirty, and must be washed often. Trays and picking boxes should be washed before use. The floor of the cutting shed, which is generally of dirt, should be sprinkled well with water to keep the dust down. Concrete or oiled floors of course require no such treatment.

This educational work is being carried on continually, and it continues to show encouraging results in improving the appearance and condition of the fruit.

After educating the growers in specific ways of effecting improvement, the Dried Fruit Association last season carried its efforts one step further by donating cash prizes to growers in each district who were found to have produced the fruit of the highest quality.

Prunes. The quality of prunes is based fundamentally upon the size of the fruit, its maturity at the time of harvest and the care taken in drying. Although no specific grower evils were prevalent in the production of this fruit, a complete program of research was devoted to the handling methods of growers. Certain undesirable practices were discovered, most of which were merely a matter of neglect. Failure to cultivate properly reduced the size of the fruit; failure to prune trees gave rise to black rot in the fruit; failure to "thin" the fruit gave not only a smaller crop, but smaller fruit as well; delay in harvesting gave a lowered quality through lack of equipment to handle the fruit, together with damage to the fruit before drying; delay in lye-dipping caused a loss in sugar through fermentation; at times the fruit was not thoroughly rinsed after the lye-dipping.

© Fruit Products Laboratory, University of California.

Soaking and washing prune drying trays before use.

Raisins. The vigilance of the Dried Fruit Association in maintaining the quality of fruit was manifested during the 1935 season. An early rainfall damaged much of the raisin crop while it was still on the drying trays, causing fermentation and mold growth and imbedding grains of sand in the raisins. Even before the crop was harvested, the Association had developed a method of analysis for these defects and had established inspection bureaus for determining the suitability of the fruit for human consumption, both as received from the grower and as packed for shipment. Mold and damaged fruit were detected with hydrogen peroxide, and sand was determined by boiling a sample in water, floating in saturated brine, decanting and measuring the amount of sand that had settled out.

Improvement of Quality by Packers

Although the greater efforts in improving quality are directed at the original source, the grower, the methods used in packing plants are also under the closest scrutiny. And improvements in methods of handling are continually being effected. All dried fruit plants in the state are subject to regular monthly inspections by a plant-inspection committee, organized for this specific purpose. Any undesirable conditions or practices are reported immediately and ordered corrected. Inasmuch as membership in the association is voluntary and rulings are adopted by all members, enforcement of such orders has never been a serious problem.

Fumigation. Insects are a cause of damage in every food plant. To decrease damage from this source, one of the chief objectives of the technical staff has been the improvement of methods of fumigation. Concrete results of these efforts have been the reduction of fumigation costs, by at least one-half, through the introduction of raw materials and methods. Hydrogen cyanide, previously used, has been almost completely replaced with other fumigants. An apparatus has been perfected for the continuous fumigation of a stream of fruit carried on a moving belt through the fumigation chamber, but, unfortunately, federal restrictions discourage the use of this efficient device because sulphur dioxide is the fumigant required.

Plant Sanitation. In any food plant one of the main considerations

is cleanliness. To curb unsanitary practices, a system of quantitative objective judging of plant sanitation has been devised. The entire system is voluntary; government assistance will be requested only if the industry cannot enforce the regulations itself. An inspection sheet patterned after that used in dairies has been drawn up, on which every plant is scored for sanitation monthly. Unless improvement is shown by those plants scoring low on this basis, policing methods will be adopted. It is worth noting that one of the larger plants was able to make a score of 99 per cent the first time it was judged on this basis. Incidentally, this was the only plant that had no condemnations on raisin shipments during the season when rain damage was severe.

Elimination of Poorer Grades. This problem has been given the most careful consideration by the industry for several years, but as yet no completely satisfactory solution for it has been found. Voluntary agreement not to purchase poor quality fruit has been considered, but this was rejected because small "bootleg" companies would arise to handle such fruit and put it on the general market to the detriment of the industry. The temporary solution has been for all packers to dispose of the fruit of lower quality in the poorer foreign and domestic markets where financial considerations prohibit the purchase of the better grades.

Some of the off-grade fruit has been disposed of in the past year through a federal agency organized to remove it from the market. In addition, financial assistance has been given to public research agencies to try to find a use for this fruit in by-products, cattle food, fertilizer, industrial alcohol or other such products. The entire problem is currently being considered carefully.

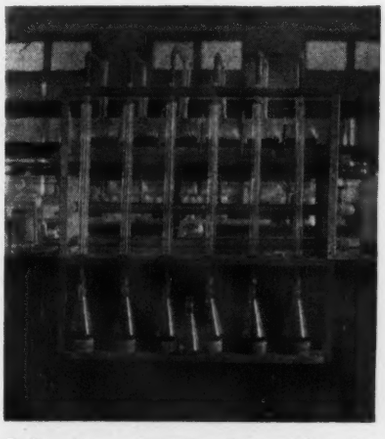
Control Laboratories. To control the quality of fruit shipped, the association is co-operating with government agencies by carrying on a voluntary inspection service of all products intended for export or interstate commerce. The high regard in which this inspection service—the Association's principal operation—is held, is manifested by the fact that many foreign countries accept the certificate of inspection as sufficient evidence that the product meets all requirements for quality. Individual packers also have established control laboratories in which all shipments are given an examination before leaving.

If the fruit fails to meet the necessary standards, it cannot be packed. If it contains excessive moisture, it must first be dried. If it should contain too much sulphur dioxide, it must either be blended with other fruit or shipped to some country with more lenient restrictions. Fruit with an excessive number of defective pieces must be hand-sorted to remove the undesirable material.

Improved Products. Individual packers have research laboratories devoted to the development of new food products and improvement of current products. A leader in this respect is the California Prune and Apricot Growers' Association, which recently developed an exceptionally tender prune that has met with great favor. The "tenderizing" process consists principally in soaking prunes in tanks of water for from four to twelve hours before processing. The moisture content is thus increased about five per cent. Another successful product of theirs is bottled prune juice.

Quality Improvement After Packing and Shipping

Dried fruit, although considerably more stable than the fresh product, is still a comparatively perishable commodity, particularly in warm weather. If packed dried fruit is permitted to remain long in a warm climate, it is apt to dry out, deteriorate in color or become infested with insects. To prevent such deterioration in quality, the Dried Fruit Association each year, at the beginning of the summer season, distributes letters recommending the transfer of dried fruit to cold-storage chambers. These recommendations are given to retailers as well as to wholesalers handling the larger quantities. Research has shown that air-conditioned storage, with controlled humidity as well as temperature, is more effective than the usual cold storage in preserving the fruit. Appropriate instructions for storage are accordingly given to the handlers of dried fruit.



Laboratory set-up for determining the sulphur dioxide content of dried fruit.

Work Yet to be Done

Although much has been done on the matter of improving quality, and much is currently under way, there are some aspects of this problem that are relatively untouched. First of these is the subject of improved storage conditions. Most of the fruit is held in storage in large bins until the time it is to be shipped. This storage cannot be considered satisfactory because the bins of fruit cannot be fumigated thoroughly. Some fruit is also damaged in removal from these bins. For maintaining quality, all fruit should be stored only in boxes, and then in closed chambers that can easily be fumigated.

It has been mentioned that fruit that has been processed and packed is adversely affected by high temperatures. This is equally true of fruit in the natural state. Cut fruits stored at temperatures above 50 deg. F. suffer materially in the loss of their original brilliant colors. To maintain this natural color of the fruit, reduced storage temperatures, preferably with controlled humidity, are necessary. Until the industry adopts air-conditioned storage there will continue to be a material loss in quality through loss in color. Cool storage conditions are also effective in reducing the activity of insects and micro-organisms.

It has been pointed out that improvements have been made in the fumigation of dried fruit. Significant advances have been made in fumigation methods under atmospheric pressures, but it has repeatedly been shown by other industries that fumigation in a vacuum chamber is by far the most efficient system. Vacuum fumigation is effective in killing not only insect life but molds and yeasts as well. As yet no dried fruit plant has installed this method of fumigation although some experiments have been conducted with it by at least one concern.

How Famous Delivery System Is Kept EFFICIENT

One of the heavy-duty Macks used by S. S. Pierce Co., Boston, Mass., for heavy retail routes and for wholesale deliveries to clubs, hotels and restaurants. "Overland" cigars are one of the Pierce private brands. Note the Pierce shield on the cab side.

S. S. Pierce Co. selects proper truck sizes, handles orders systematically and uses collapsible box.

DELIVERY of choice staple groceries and delicacies to the homes of thrifty New England housewives within a radius of approximately 40 miles of Boston is the daily task set for the motorized fleet of the S. S. Pierce Co., Boston, Mass.

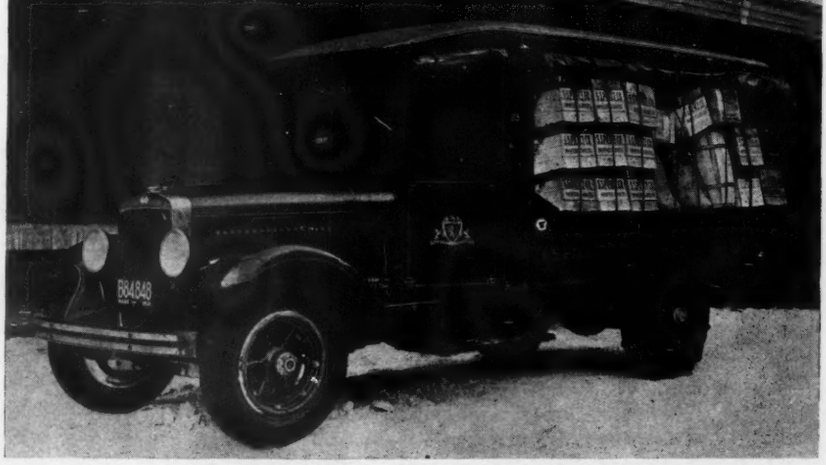
Founded 106 years ago, the S. S. Pierce Co. is famous throughout New England for the excellency of its great variety of staple groceries and imported and domestic delicacies; cigars, wines and liquors, perfumery and toilet goods, candy and the products of its own bakery kitchen. It is likewise famous for the dependability of the delivery service to the housewife, who is the retail customer. In addition to supplying housewives, the company also does a large wholesale business to hotels, restaurants, clubs and other outlets within its retail delivery area, making these deliveries by its own fleet of trucks. Then the company operates six retail stores of its own in the retail delivery area and also does a large volume of business through associated dealers outside of that area.

These dealers are located principally in the states of Massachusetts, Rhode Island, Connecticut, Maine, New Hampshire and Vermont. Goods to these dealers are shipped by rail or express and are therefore not handled by the S. S. Pierce Co. truck fleet.

In the "good old days", the Pierce company was as famous for the excellence of its horse-and-wagon equipment as for the goods it sold. New England horse fanciers still recall with pride the three, four and six-horse teams seen on Boston streets. But the last of the horses were disposed of in 1921. Now the Pierce delivery equipment consists of 65 trucks, of which 50 are used on retail routes and fifteen on wholesale routes nearer Boston.

Because of the great variation in weight, size and shape, groceries are not easy to handle. But out of long experience in the business, the Pierce company has developed certain principles of operation insofar as its delivery equipment is concerned. These principles include the determination of three sizes of trucks (light, medium and heavy) for its retail and wholesale routes; continual study to improve its system for making up, handling and loading the individual customer's orders; and the use of a collapsible wooden delivery box.

The three sizes of trucks found most desirable are the 1½, 3 and 5-ton units. By makes, these are Fords, Chevrolets, Internationals and Macks.



Three types of vehicles—light, medium and heavy—are used by the S. S. Pierce Co. for retail grocery routes. This is a medium unit, an International of 2½-ton capacity. Note the collapsible wooden delivery boxes and how the load is held in place by a rope lacing. This truck is used on heavy retail routes and has a 10-ft. body with a capacity of from 150 to 180 wooden boxes. Note that large single tires are used in the rear in place of smaller duals. This is to prevent damage to lawns when entering the narrow driveways of private homes.

All the Pierce goods are delivered from a large central warehouse in Boston. Here the grocery orders are assembled on the second floor by taking the various items from stock shelves and placing them on belts traveling to a central sorting station. There items are collected in sorting cars hanging from a monorail. These cars when loaded are moved to the checking station where the orders are checked out into the individual collapsible wooden boxes for each customer. The boxes are then sent by belt to the shipping department, sorted by routes, placed on "flats" and moved to the truck-loading section.

The above procedure applies to groceries only. These are not packed or wrapped for truck delivery. However, cigars, liquor, perfumery and toilet goods, candy and bakery goods, orders for which are made out on sales sheets differing from those used for groceries, are wrapped separately and separately transferred to the truck-loading space.

The above work is done on the day of the receipt of the orders. Local deliveries are made on the same day, and suburban deliveries and deliveries to more distant points on the day following. The drivers report from 6 to 8 a.m. depending on the type of delivery, and begin sorting out the boxes for their routes so as to load them onto their trucks in the reverse order to that in which they will be delivered.

The drivers then check their wrapped or packed orders with their grocery orders. If any of the former are going to customers also receiving groceries, the wrapped goods are placed in the proper boxes carrying the groceries. Orders for wrapped goods going to customers not receiving groceries are placed in separate wooden boxes.

The Pierce company does not handle green goods, vegetables or meat. But it does handle butter, cheese and some cream. Orders for these commodities are assembled separately.

To keep them in good condition until delivered, these goods are placed in a small insulated chest provided on each route truck. For years these truck boxes were refrigerated by means of ordinary ice. Now, however, an improved box using dry ice is employed. These boxes are used each year from May 1 to Oct. 12.

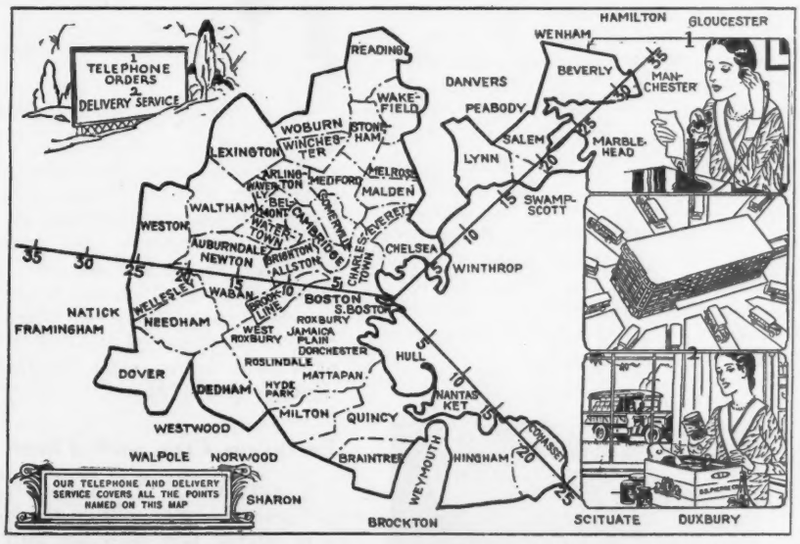
Notwithstanding seasonal fluctuations in the delivery volume, the Pierce company is able to handle its business with its own fleet except in the two weeks preceding Christmas. And then only six trucks are hired to handle incoming shipments and some wholesale deliveries. While the Pierce warehouse is located on a rail siding and most of its good are received by rail, it receives imported goods and certain commodities from the West Coast via Boston ship piers, and also some goods from local warehouses. It is principally for this work that hired trucks are used.

During the remainder of the year, the regular Pierce trucks and men make all the deliveries. In the summer, additional seashore routes balance the reduction in the number or frequency of covering the city and suburban routes. Retail routes are run either daily, every other day, every third, fourth or fifth day or once a week, depending upon the territory and the volume of business.

The Pierce company maintains its own truck-repair shop and body-repair and painting facilities. Three trucks of its fleet are undergoing repairs or painting on regular schedules throughout the year, except during the Christmas peak when all trucks are ready for work. This low ratio of spare trucks—one to approximately 22, while the general average among fleet owners is one to ten trucks—is due in part to the company's preventative-maintenance-plan and to its policy of trading in trucks before they have to be completely rebuilt.

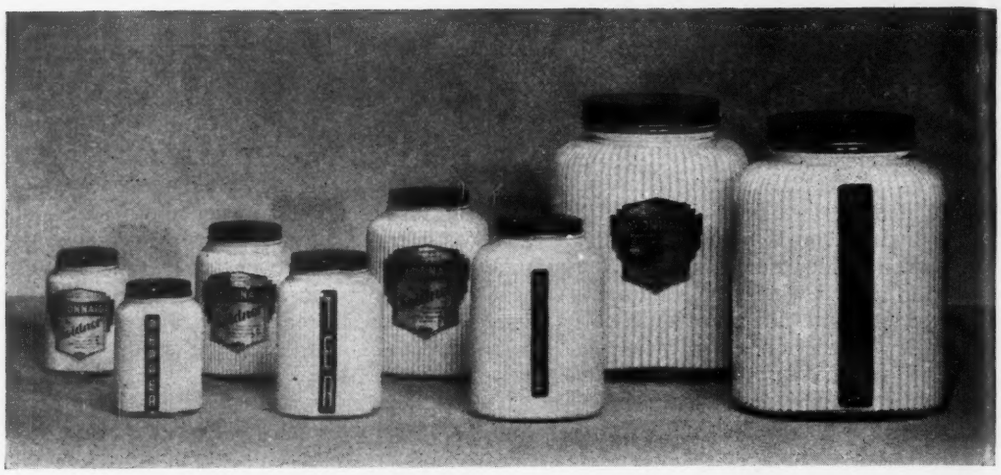
The Pierce bodies are specially built, as may be seen from the accompanying illustrations. When a truck is traded in, the body is removed and transferred to the new vehicle.

The company uses the cost per stop as the measure of its delivery efficiency, rather than the cost per mile, cost per 100 lb. or cost per ton. It maintains individual truck and tire-cost systems and believes these are more than justified by the results obtained.



Area covered by the delivery fleet of S. S. Pierce Co. and diagrams illustrating how the company capitalizes on its efficient delivery system to attract customers.

One of S. S. Pierce's light trucks, a 1½-ton Chevrolet with an 8-ft. body having a capacity of from 100 to 110 of the collapsible wooden boxes. Note also the dry ice box used to keep butter, cheese and cream in good condition until delivered into the customer's kitchen. The truck is used on local city routes.



New PACKAGES AND PRODUCTS

New Arrival in Royal Family

IN THE August issue of FOOD INDUSTRIES, the tenth member of the Standard Brands Royal Dessert line was announced, Royal Salad Gelatine with a meat-like flavor. Standard Brands, Inc., now announces another new member, Royal Butterscotch Pudding. Butterscotch Pudding for the institutional market made its debut a few weeks ago. Consumer's size, 4½-oz. packages are now being distributed to the grocery trade throughout the country. Royal Butterscotch Pudding with arrowroot as a thickener is suggested as a dessert by itself or as an ingredient in home-made butterscotch ice cream.

Picnic Basket Container

AN ATTRACTIVE BLUE METAL PICNIC basket with bent wooden handles is used by Keebler Co. as a display container and premium inducement for its cookies. Five pounds of cookies are packed in each picnic basket container. An arrangement is made for the sale of the picnic box with the last purchase. However, many retailers have found little resistance to the sale of the 5-lb. container to those who desire to possess the attractive picnic basket. The product packed in this type container is sold mostly in better class neighborhoods through quality stores.

Premium Free with Three

AN ATTRACTIVE KITCHEN-SHELF SALT CONTAINER—color scheme red and white—is offered free with the purchase of three packages of "Diamond Crystal" salt, product of Diamond Crystal Salt Co., St. Clair, Mich. This premium offer, according to supermarket operators, has stimulated sales of the product.

Reuse Container Clicks

BEFORE THE NEW REUSE CONTAINER for Otto Seidner Co.'s mayonnaise could reach consumers, distributors' orders had absorbed the day and night capacity of the plant. Opposite the label on each container is a black waterproof strip on which appears in gold the words: "Sugar," "tea," "rice," "pepper," "flour," etc. Each week production of the different containers will be rotated at the factory so that one week pints of

mayonnaise reach the trade in reuse pepper containers, and the following week pints reach the trade in reuse tea containers. Seidner's mayonnaise is packaged in pints, quarts, half-gallons and gallons. The gallon containers are designed for reuse in restaurants and institutions. The smaller containers are for pantry-shelf reuse. The importance of reuse containers as sales stimulants declines sharply as consumers accumulate the packages. The great variety of combinations in the Seidner line suggests a lengthy period of sales stimulation. Seidner mayonnaise in the new and more costly containers is reaching the trade at no advanced price.

Pink Grapefruit in Cans

PINK GRAPEFRUIT, a "Red Label" product of S. S. Pierce Co., Boston, Mass., has recently made its appearance on the Eastern market. Pierce's pink grapefruit is made from peeled, selected sections of grapefruit the natural color of whose meat is pink. Pink grapefruit is a member of the Pierce family with the fiery-red labels.

Packaged Bread Sticks

PACKAGED ITALIAN BREAD STICKS in 4-in. lengths are appearing in groceries and supermarkets in the New England market. "Quin-Zani" Italian bread sticks, product of Quinzani Bros., Boston, Mass., is packaged in a paper window box wrapped in transparent cellulose.

Bouquet to Lowly Onion

AN OUTCAST along with garlic and cabbage, the lowly onion has recently been given eminence by S. S. Pierce Co., Boston, Mass. Under the name, "Blue Brand," S. S. Pierce is marketing native, small, whole, cooked onions. The label is dark blue with the typical Pierce family band in light blue.

Half-century Tradition Ends

FOR ALMOST 50 YEARS, sardines have been canned in flat, square cans with rounded corners. The guillotined fish in this type of container are packed side by side the length of the can. The only innovation has been a slight variation of the flat square to the flat oval can. California "Treasure" brand sardines, product of Coast Fishing Co., Wilmington, Calif., are now packed in tall, round cans. The fish is cut into segments, the segments packed upright in the can. One of the advantages of this type pack is that a larger portion of the fish goes to human consumption and a smaller portion to fertilizer.

Trade-branded Tomatoes

TIME WAS when potatoes were potatoes, tomatoes tomatoes, and produce just produce, but today vegetables and fruits are rapidly being identified by the trade names of producers or marketing associations. Massachusetts tomatoes are reaching the market under the brand name "Vine-Ripened Massachusetts Tomatoes." This trade name is accompanied by the name of the individual grower. The tomatoes are individually wrapped and packed in corrugated boxes that open to form a display container for the product. Brand name and name of grower, which appear on the underneath side of the carton lid, are visible when the carton is opened for display.

Lengthens Life of Celery

THE NEW PACKAGE adopted by the Muskegon Cooperative Celery Growers Association, Muskegon, Mich., for the marketing of its product not only presents celery in a container with eye-appeal, but preserves the crispness and lengthens the life of the product. The "High-Ball Brand" celery package will contain three stalks of celery visible

through a transparent window in the front of the carton. This carton is designed to fit conveniently into the home refrigerator. "High-Ball Brand" celery packages are packed in shipping containers, ten to the carton.

Merchandising HINTS AND HURDLES

Dwarf Supermarket. During the last six months, Grand Union Corporate Chain has installed more than 40 of its new type "Shield-U-System" units, in which a few supermarket characteristics are combined with the best features of the typical chain unit. Although a portion of the 600 rapid turnover items are displayed in stacks for self-service, the service clerk is an important part of this store. He replenishes shelf and display stocks, totals, sacks and receives payment for purchases. There are, however, no cash registers, no scales, no counters (in the orthodox sense of the word). Most S-U-S stores have dispensed with paper bags and sell shopping bags for 1 cent without loss of trade. S-U-S stores depend on a stock turnover 40 times per year and, therefore, stock mostly nationally advertised brands. Prominently present, however, are those Grand Union private brands for which strong consumer acceptance has been built.

These stores sell no fresh meats and only seven produce perishables, grapefruit, oranges, lemons, bananas, apples, potatoes, onions.

Recently a S-U-S store has taken quarters in the back of a Brooklyn variety store. If Grand Union is able to secure a profitable volume from this store, some food manufacturers at least will welcome the new type of outlet. Candy and nuts have been a profitable part of the variety store almost from its inception, but other food items, except prepared food, still await the arrival of a successful merchandising method. For more than ten years, Woolworth has had canned- and packaged-food departments in many of its units. Less than half the Woolworth stores, however, now display groceries, and few have a grocery volume of consequence. Other variety chains have experimented with grocery departments. The experiments have been short-lived.

It has been the experience of concession-type supermarkets that when the grocery department is strong, the supermarket is a food store—the food concession profitable, other concessions weak and usually unprofitable. When the food department is minor, the supermarket becomes a general store with the food department's volume usually insufficient for it to carry its proportional pr fit. There seems to be an antipathy among consumers to supporting general-merchandise departments in a food store or a grocery department in a general-merchandise store. If Grand Union is successful in operating a grocery store as part of a variety store, it will have cleared the path for greater inroads into existing methods of food distribution.

Price-fixing Legal, But—. The Miller-Tidings Law legalizes the manufacturer's right to fix the price of his trade-marked and branded products in the 42 states which have passed fair-trade laws. The law legalizes price-fixing agreements between producer and distributor in interstate commerce to the extent of the 42 states with price-fixing laws.

Passage of the law will introduce into many channels of distribution new innovations in merchandising and marketing. Some producers will be handicapped, others unshackled. The trade balance in many industries will be distorted. In the food industries, however, there will be little change as a result of the law.

Wherever distributor groups are organized and can act as a majority body, they can force most manufacturers of trade-branded items to fix and maintain prices. The object, of course, is to eliminate the cut-price chiseler and also to reap a better margin for the distributor. If the manufacturer does not conform, his product goes under the counter and sales volume toboggans. If he conforms, the "fixed price" may allow too little margin for the small independents who, as a group, may account for a considerable drop in sales volume when they fail to stock the item. If the price is satisfactory to the small operators, it may open the gates for distributor brands of large operators. Price-fixing has few dilemmas in the absence of competition, but when competitors are many, price-fixing may be hazardous.

Food distributors fall into four groups. The strongest in volume of sales is the corporate chain. Chains prefer to play with the prices of trade-branded groceries. It is a part of their merchandising technic. It is improbable that the chains will demand price fixing. Voluntary chains and retailer cooperatives make the second group. They, at present, are in the same camp with the corporates. Both groups swing a distributor-brand club over the heads of the manufacturers of trade-branded items. Although minor in volume, supermarkets are in ascendancy. They too relish the flexibility

With the exception of week-end specials, limited to two items, S-U-S stores feature no cut-price sales. They depend on prevailing low prices in line with supermarket prices to attract and maintain sales volume. S-U-S stores do no advertising.

of prices on their major items, manufacturers' brands. The remaining group, made up of independents, though large in number, accounts for a small percentage of volume. Manufacturers will turn a deaf ear to their demands.

Either of the stronger groups, the corporate chains or the voluntary chains, might welcome the subsidy which price-fixing of manufacturer's brand might furnish their own distributor brands, but there is little likelihood that the two groups will act in harmony to bend the trade brand manufacturers to their will.

The wording of the California fair-trade law, after which the other 41 states modeled their laws, places all brands in one of two groups as indicated by the following excerpt of the law: "Section 1. No contract relating to the sale or resale of a commodity which bears, or the label or content of which bears, the trade-mark, brand, or name of the producer or owner of such commodity, and which is in fair and open competition with commodities of the same general class, produced by others." The wording of these laws defines all packaged food items as either manufacturers' brands (whether advertised or not) or distributor brands (whether advertised or not), and may make archaic the general terms "national brands" and "private labels", which terms are based on the employment of national advertising rather than the ownership of the brand.

The Fourth Meal. *True Story Magazine* recently conducted a survey among office workers of various economic levels to determine what they did with their time from 6 P.M. until the time of retiring. It is interesting to food manufacturers that 55 per cent of all persons replying said that they had a "snack lunch" before retiring. Fifty-nine per cent had both food and drink, 18 per cent had food only, 13 per cent had drink only. The following table shows the importance of various food and drink items.

Food and Drink Combinations

	Total	Milk	Coffee	Tea	Beer	Other
Total	84	37	17	11	11	8
Cake, cookies	30	16	8	4	—	2
Crackers	12	8	1	1	—	2
Crackers and cheese	10	2	1	1	6	—
Meat sandwich	10	3	3	2	1	1
Sandwich	7	2	2	—	2	1
Other	15	6	2	3	2	2

Midget Sizes Popular. Especially in congested metropolitan areas where the small family is predominant, the midget- or buffet-size tin container is popular with consumers and a profitable item to manufacturers and distributors. Supermarkets in or near these congested areas particularly like the buffet size container. They are economical of display space and generally net a longer profit than the larger sizes. Many housewives prefer this size container because it eliminates waste, obviates the serving of left-overs and permits more variety at meals without greatly elongating the budget. In many metropolitan markets, considerable shelf space is given to the buffet-size can not only because of consideration for consumer preference but because of profitable movers. In line with this trend some manufacturers are lowering the content of their regular pack from 1 lb. 2, 3, or 4 oz. to 1 lb. net, adopting a correspondingly smaller can size. In the face of rising prices many housewives prefer a smaller quantity at the same price to the same quantity at a higher price. Some housewives never know the net contents, anyway.

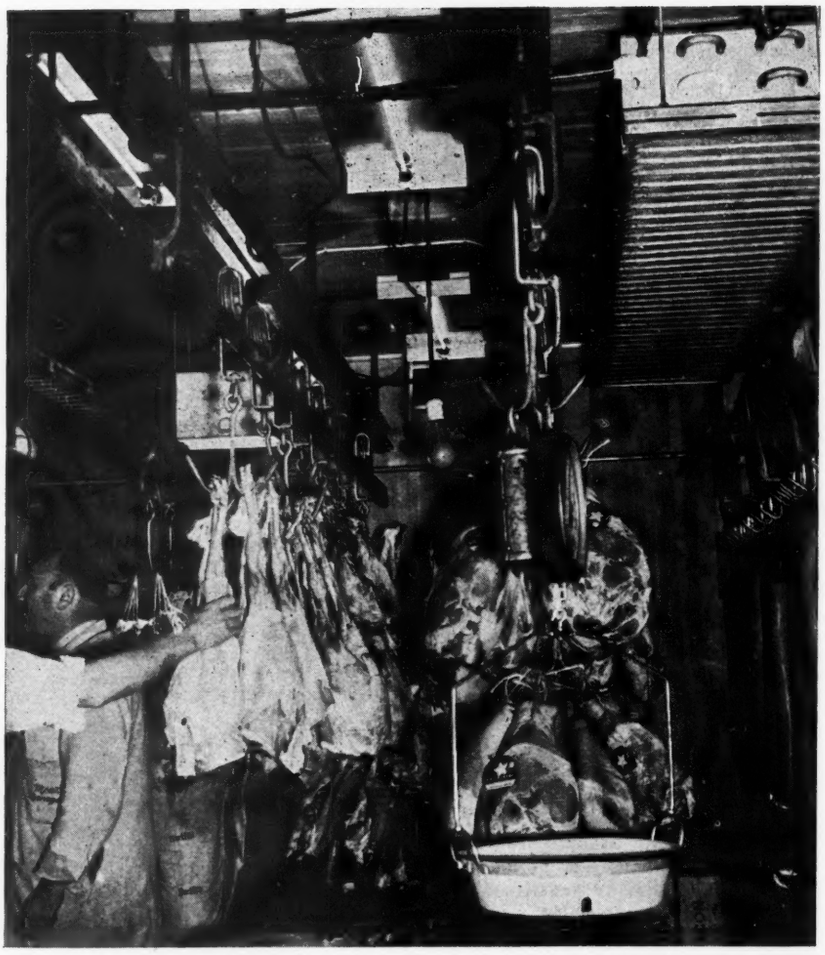
The 7½ to 9 oz. buffet size cans are accounting for an increasing percentage of canned goods sales in congested metropolitan areas.

Although S-U-S stores employ clerks, customers help themselves to much of the plainly marked merchandise stacked on the floor in the original cartons.

Single package vs. two or more. In a test conducted by General Mills, Inc., Minneapolis, "Wheaties" were offered for sale two for 23 cents or one for 10 cents. The number of packages of Wheaties sold at two for 23 cents was 33 per cent higher than the number sold at ten cents per package. Manufacturers profit who study the psychology operative at the point of purchase. FOOD INDUSTRIES plans to provide case histories. Through the cooperation of a group of retailers, FOOD INDUSTRIES has been conducting experiments in point of sale display and the movement of related items. The results of these tests will be disclosed in an early issue of FOOD INDUSTRIES.

Another Example of Supermarket Progress

Improved methods of meat handling may reduce prices



Ultraviolet lamps overhead protect meats from bacteria and mold in this supermarket cold storage room at temperatures that permit enzymatic action to age the meat rapidly.

IT SHOULD BE IMPORTANT NEWS TO manufacturers and processors whose products reach the consumer as perishables that at least one chain of supermarkets is performing a function that might well be done by the meat packer. They are aging and tenderizing meats as well as preserving them from the action of bacteria and mold in their own cold rooms.

This aging and tenderizing of meat is being done with the aid of an ultraviolet lamp, not the general type, but one operating on a special narrow band of the radiant-energy spectrum. The application of this lamp for rapidly and economically aging meat and generally killing all types of bacteria and mold, was discussed in FOOD INDUSTRIES, June, 1936, page 295. It was pointed out in that article that a practical test was conducted in the plant of Nathan Switzer Co., Inc., New York, more than two years ago, to check the performance of these lamps under practical operating conditions. In the beef-storage room, a small space of about 500 cu.ft. was partitioned off and seven lamps installed. Instead of being cooled to the usual 35-38 deg. F., the space was allowed to rise to a temperature of 50 deg. F. to speed the enzymatic action which tenderizes meat. Even at this high temperature, neither mold nor bacteria grew on the meat aged in five days to a tenderness which formerly required five weeks. The stamp of approval was placed on the ripened meat by New York chefs.

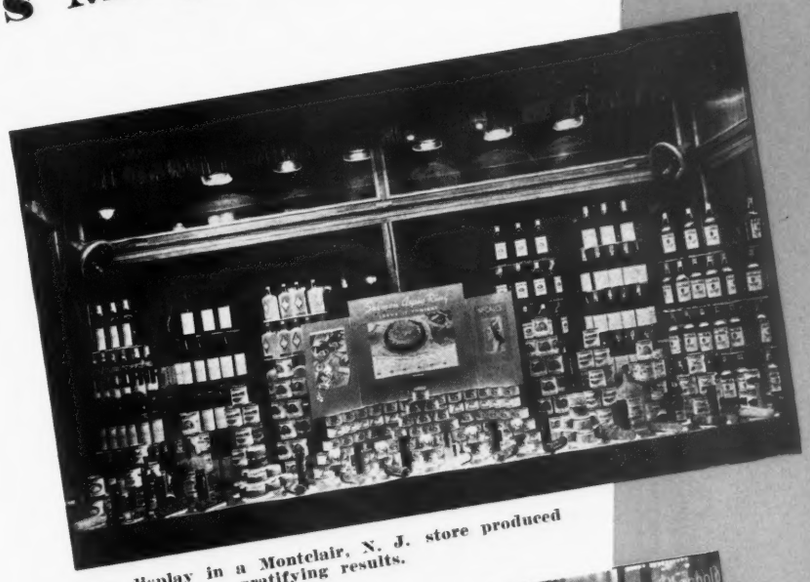
At the Merchant Refrigerating Co., New York, 1,400 lb. of beef was aged at one time at temperatures of 55 to 58 deg. F. and relative humidities of 90 to 100 per cent. Aging under these conditions required three to four days as compared with the three to five weeks formerly required. Shrinkage or weight loss amounted to $\frac{1}{4}$ of 1 per cent. Trimming waste was limited to removing the thin darkened surface. Application of this lamp to the baking industry for preserving fruit cakes and similar high-moisture-content bakery products was also discussed.

The results from the use of the ultraviolet lamp by one group of supermarkets have in a few months paid the installation and operating costs many times over. Spoilage losses, no small factor of the retail price of meat, have been reduced to a minimum. In one case, a shipment of lamb arrived at the peak of a hot, humid spell in such a condition that, under the supermarket's normal refrigerating methods, spoilage of a large portion of the shipment would have occurred before the shipment could be moved to the consumer. Under the protection of the "ray lamp," the lamb was still fresh and salable two weeks later. The savings from spoilage loss on this one shipment was estimated at $500.

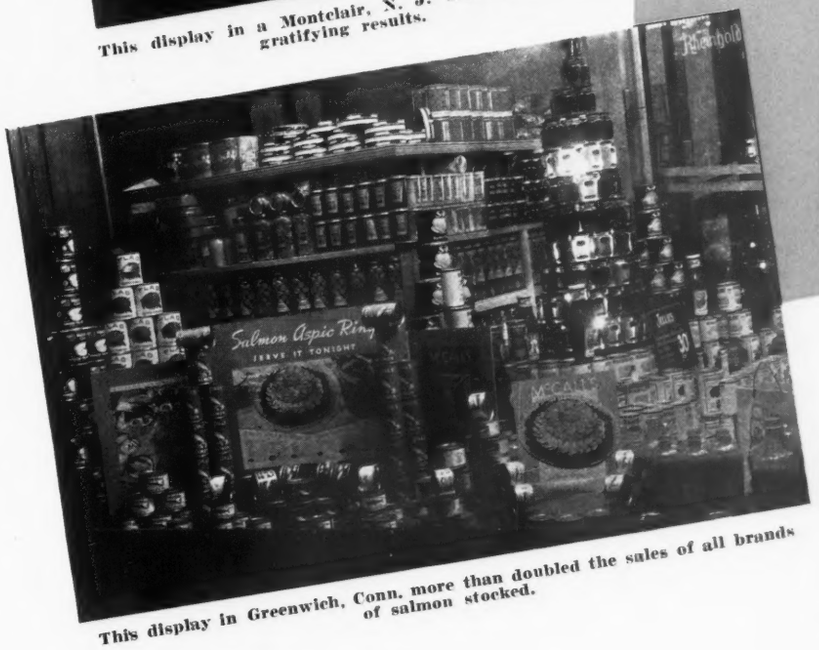
Installation cost of the ultraviolet lamps is low. Two lamps and transformer can be operated for less than one ordinary 25-watt light. Savings are effected by reduced load on refrigerating machinery. Refrigerators can be maintained at temperatures between 45 and 55 deg. F. without loss of meat, as compared to the average practice of maintaining temperatures as low as 35 to 38 deg. F. Aging and tenderizing of meat in the supermarket's own refrigerating rooms permit the market to establish a reputation with consumers for high-quality meats at economical prices. Low-grade, inexpensive meats are aged to produce quality cuts.

Because of its size and the volume of sales, the supermarket can and will perform more and more of the functions of the manufacturer and middleman wherever they can thereby reduce waste and the cost of distribution.

Point-of-Purchase Influence of Women's Magazines



This display in a Montclair, N. J. store produced gratifying results.



This display in Greenwich, Conn. more than doubled the sales of all brands of salmon stocked.

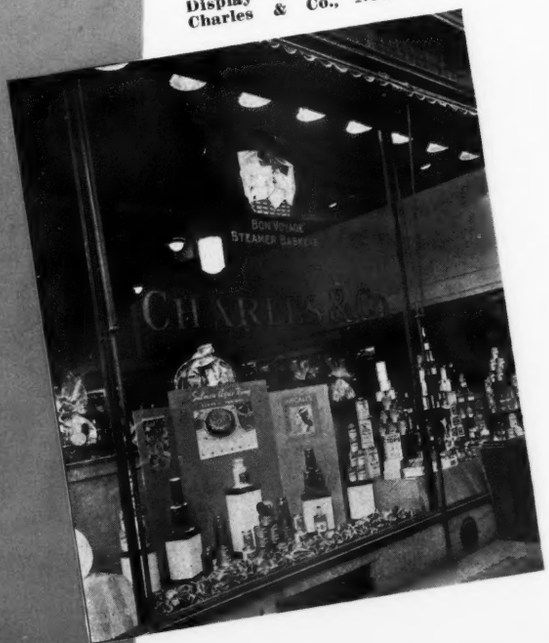
MANUFACTURERS FACE TWO MAJOR PROBLEMS in point-of-purchase display advertising. The displays must sufficiently increase sales to justify their expense. The displays or methods of "selling" them to retailers must guarantee justifiable space and time in the retailer's window or store.

A. C. Nielson, head of a Chicago marketing research organization, in an address before the convention of the Lithographers National Association, stated that the results of a check study in 2,000 retail stores proved that manufacturers are not getting the counter and window displays in retail grocery stores that they think they get. Millions of dollars are spent each year by manufacturers in preparing displays to be used at the point of purchase. Much of this material never reaches the retailer, much of it is never used by the retailer when it does reach him. In one case, less than three thousand out of a quarter million expensive food displays ever found a place in a retail grocery store.

The sales stimulation of point-of-purchase display is not to be questioned. Manufacturers' displays *when used* generally justify their cost. When not used they represent a costly waste. Many more window display posters are prepared than there are grocery windows to receive them. Floor and counter displays are printed in numbers far in excess of the available spaces for them.

During recent months FOOD INDUSTRIES has been conducting field studies in order to furnish food manufacturers with intelligent aids in solving point-of-purchase display problems. In this study, manufacturers, wholesalers and retailers were interviewed—housewives were questioned too. From the latter came one suggestion that could be tested. Women think of food items in terms of dishes and meals. They think of pineapple slices as a part of a salad. They think of flour in terms of cakes and pies. Women will welcome in a retail store an idea for a new or different dish, or a suggested menu for a meal. Women want these ideas illustrated.

Display in the window of Charles & Co., New York.



The food pages of women's magazines feature new recipes and furnish illustrations of new and different dishes, even of complete meals. Therefore, as a means of testing the ideas advanced by the women interviewed, FOOD INDUSTRIES prepared posters built about the illustrated food pages of these women's magazines. Arrangements were then made with retail store owners to test the effectiveness of the displays. Only those retailers were chosen who were able to trace sales by the week and throughout

(*Turn to page 600*)

A New Way to EXPAND

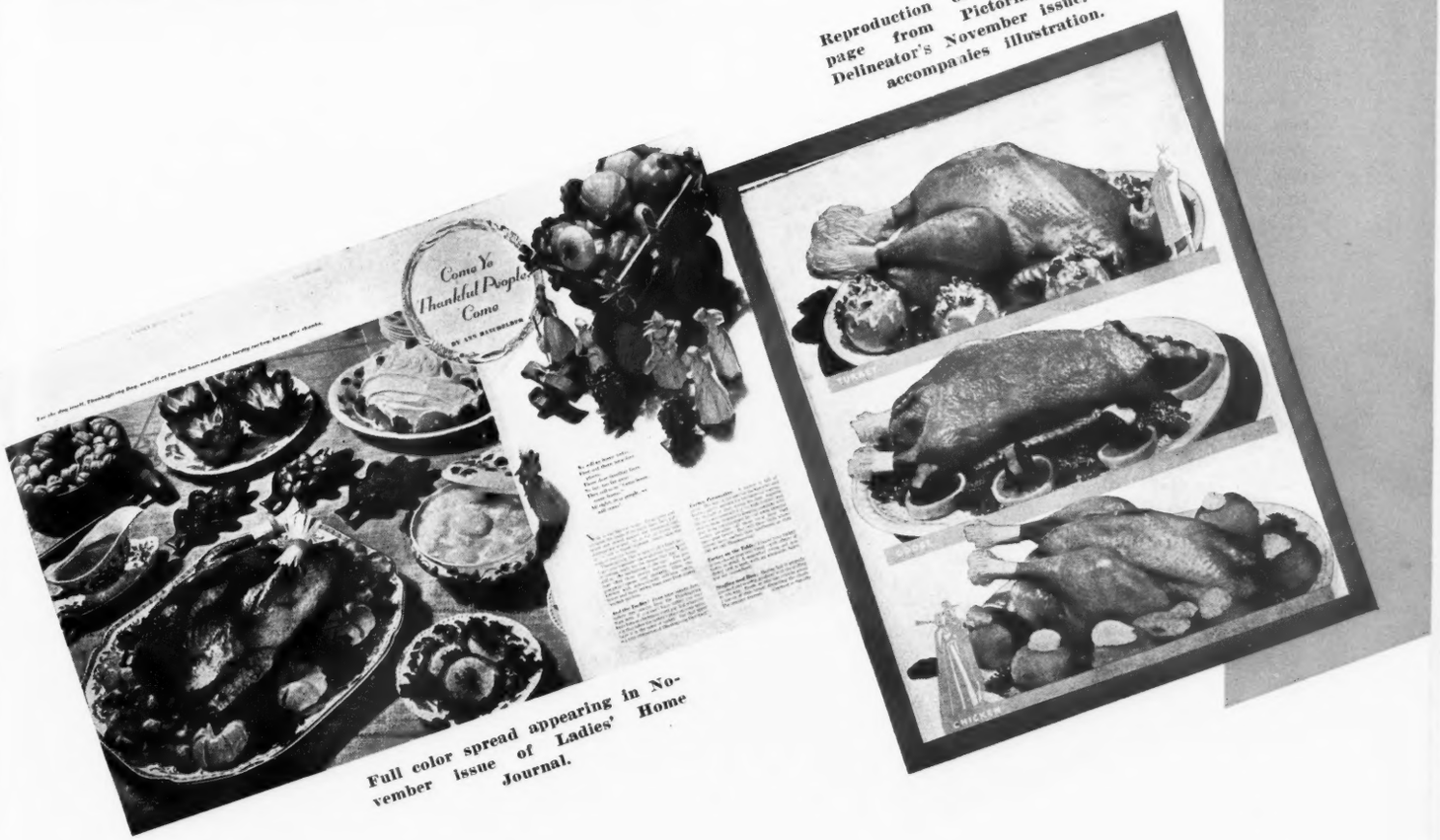
Manufacturers whose products are illustrated in one of these woman's magazine food pages can increase sales through the use of posters bearing mounted reprints.

Full color spread appearing in November issue of McCall's.

Reproduction of full color single page from November issue of Good Housekeeping.

Reproduction of full color spread from November issue of Woman's Home Companion.

IMPULSE SALES . . .



Reproduction of two-color single page from Pictorial Review-Delineator's November issue. Text accompanies illustration.

Full color spread appearing in November issue of Ladies' Home Journal.

A DESCRIPTION of the food section contents of the November issues of these women's magazines is furnished as a guide to manufacturers, the sale of whose products may be stimulated through store displays built about reprints of one of these pages mounted to make a poster.

McCALL'S: Full color spread featuring five recipes for meat dishes, among them the illustrated dish. Ingredients for this dish are ground beef and pork, canned peas, canned onions, packaged bread crumbs, produce and seasoning. This color spread is suitable for the promotion of the meat packer or vegetable canner. Other recipes call for the use of various meat cuts, canned vegetables, condiments and staple foods.

WOMAN'S HOME COMPANION: Full color spread illustrates "Smörgåsbord Table" for Halloween party, buffet dinner, or cocktail party. Text furnishes recipes for dishes made with noodles, canned or frozen peas, canned pineapple, canned mushrooms, condiments and staples. This spread should be helpful in promoting the sale of hors d'œuvres, canapes, bakery products, canned vegetables and meat products. This food section also contains black and white illustrated three-column article on the preparation and cooking of fowl.

GOOD HOUSEKEEPING: Food feature in full color suitable as a single page or spread. Recipes for Thanksgiving dishes, in accompanying two pages of text require as ingredients fowl, oysters, baked ham, canned peaches, grapefruit segments, cranberry jelly, spinach, string beans, mushrooms, and coffee. Many manufacturers' products are covered by these recipes.

LADIES' HOME JOURNAL: Full color spread suggesting Thanksgiving menu. Poster could be used by packers of dressed or frozen poultry or by manufacturers of canned pickles, pineapple slices, maraschino cherries, cranberry jelly, plum pudding, sweet potatoes, onions, and French or salad dressing. Manufacturers of pickles, olives, preserves, jams, etc., might find this spread helpful on a point-of-sale poster.

PICTORIAL REVIEW-DELINEATOR: Single page in two colors with accompanying text suggesting methods of preparing and cooking turkey, goose and chicken. Suitable for packers of dressed or frozen fowl, either as a single-page poster or as a spread.

• ***Reprints of these pages mounted to make posters may be obtained from the respective magazines before or by the time the magazines reach their readers*** ***(see p. 600).***

the previous month, and those willing to keep records during the week in which the displays were featured. Displays were prepared in advance and were released to these retail stores at the time the magazines reached the news-stands. One display featured a salmon salad ring suggesting the use of canned salmon, aspic gelatine and other ingredients. Retail store merchants using this display were only requested to display two items—canned salmon and aspic or flavored gelatines. The selection of brands and arrangement of display were up to the retailer.

In addition to the request for accurate data only one other request was made. In order that the results might be a fair indication of the impulse sales generated by the display, retailers were requested not to place any sales effort behind the products displayed. Although no suggestions were made to retailers regarding the price of any commodity displayed, only one store offered a feature price on any item. This was the Montclair Food Co.'s store in Montclair, N. J. This store placed a feature price on canned salmon but not on gelatine. According to the store's report, the sale of salmon during the week of display increased from approximately 1½ cases per week to 11½ cases per week. Aspic gelatine sales increased from twelve packages per week to twelve dozen packages per week.

Records of the Cohen Bros. store in Greenwich, Conn., were more detailed. This store featured in its window a variety of brands of salmon including Richelieu, S. & W., Premier, and Cloverleaf in various can sizes. Cohen Bros.'s store report shows an increase for 1 lb. flat cans of salmon from three to eight cases per week, tall 1 lb. cans from two to five cases per week, ½-lb. flat cans from three to eight cases per week. The report on gelatine covered all gelatines, flavored and unflavored. Sales of gelatine increased from 1½ cases per week to 2½ cases per week. Identical window display posters were used in Cohen Bros.'s store in Greenwich, Conn., Montclair Food Co.'s store in Montclair, N. J., and Charles & Co.'s store, New York City.

The display used in the Big Ben supermarkets in Oyster Bay and Freeport, L. I., featured only the salad ring and the recipe for making it. This display did not emphasize the identity of the woman's magazine as strongly as did the other displays. What was designed for and intended as a window display poster was used by these supermarkets as a table display poster. Del Monte salmon and aspic gelatine were featured. The report of the Oyster Bay

Inside table display built about a window poster in Long Island supermarket.

store recorded only the sales made from the display table. During the test week, the sales of one brand of salmon from the display table were twice as great as the total sales of all brands the previous week. Aspic sales increased 8½ to 1. Results in the Freeport market were almost identical. However, one interesting fact was noted by this store. Sales from the special display did not diminish sales of salmon and aspic from the regular displays.

Retailers in the neighborhood of the other stores where displays were used, with the exception of Charles in New York, were questioned regarding the sale of salmon and aspic during the period covered by the test. In no instance were local retailers aware of any unusual movement of aspic or salmon. This study indicates profitable returns to manufacturers who can adapt their display advertising plans to this idea.

Mounted reprints, in lots of not less than 1,000, single-pages on 14x22 in. posters, spreads on 28x22 in. posters, may be obtained from the magazines ready for use, at moderate prices (actual cost).

Each poster will carry the printed line "As Seen in November Issue of ..... magazine." The manufacturer's selection of caption or selling "slug" such as "Try this salad tonight", *"McCall's* Meal of the Month," etc., will be printed at the top of the poster. No posters will bear the name of a manufacturer or trade brand.

Results of continuing tests by Food Industries, although not yet conclusive, indicate that sales increases from this type of display without the name of manufacturer or his product appearing on the poster, are greater than when the manufacturer's own poster is used.

There is one feature of this type of display poster that is merchandisable. Most of the dishes and menus illustrated in the women's magazines require a number of ingredients. A display of the required items built about the poster increases sales on not one but many products the grocer sells. Increased sales of many related items increases total store volume. The grocer will therefore use this type poster more readily than the usual manufacturer's poster designed to sell only one item.

This display stimulated sales less than those used in stores in Greenwich and Montclair.

When Will These Trucks Be Too Old?

EVERY ONE who is distributing food is constantly facing the question of whether some of his vehicles have been in service too long to profitably be kept in operation. Factors on which trade-in decisions should be based are discussed below by executives operating fleets of trucks and commercial cars in the food industries.

Trucks Run 60,000 Miles

Whether it is cheaper to trade in a truck or commercial car than to repair it at the end of the first year depends entirely upon its mileage. And 1½-ton trucks should be traded at 60,000 to 75,000 miles. Repair costs, as well as mileage, are a factor in determining the time to trade.

In depreciating motor vehicles, both mileage and age should be taken into consideration—R. A. BRODESSER, *Vice-president, Southern Dairies, Inc., Washington, D.C.*

Avoids Major Repairs

The resale value at the end of the first year is usually so much less than the first cost that we have found it profitable to make minor repairs and not turn in our trucks until major repairs are required. This has generally been after operating the truck 2½ years or more.

We trade in our cars when cost of operating, including repairs, exceeds the cost of operating a similar new truck by a substantial amount.

According to our experience, an average of 20 per cent per annum takes care of our depreciation. Some depreciate more than this, some less.

In our opinion, a truck should be depreciated in direct proportion to its mileage. We believe that each truck should be depreciated on its own performance and condition, but we have never been able to get the Department of Internal Revenue to accept this kind of depreciation. They have insisted on taking the average experience of all our trucks. And as they have given us 20 per cent per annum as our depreciation, we use this figure. However, we think the plan is wrong as it is based on conditions which may change from year to year. Mileage depreciation would be more consistent, reliable and equitable. —L. J. SCHUMAKER, *President, American Cone & Pretzel Co., Philadelphia, Pa.*

Trucks Operated 4 or 5 Years

We have found that it is not sound judgment to replace trucks each year unless we find the car has been badly neglected or damaged in accidents. Our experience shows us that the average truck should be replaced at approximately four to five years of operation, or 70,000 to 80,000 miles.

The trade-in barometer that the writer has been guided by for a number of years, and has found to be more or less sound, might be summed up as follows: Whenever it costs the equal of a year's depreciation to rebuild a truck and put it in first-class order, it is sounder judgment to replace it with new equipment.

Our depreciation is 17½ per cent on trucks of less than 10,000-lb. gross capacity. On all equipment over 10,500-lb. gross capacity, we are depreciating at the rate of 20 per cent. These depreciation figures were arrived at on the mileage basis as indicated above. Other fleets may find that this percentage will vary because of their mileage.

Although we firmly believe that a truck should be depreciated in direct proportion to its mileage, we have found it more satisfactory to base depreciation on a time period predicated on an average mileage of our trucks. This is because of the extreme amount of clerical work necessary to establish a program of mileage depreciation.—TIMOTHY BALDWIN, JR., *Kraft Associated Distributors, Inc., Chicago, Ill.*

New Method Needed

As to the advisability of trade-in at the end of a year, it depends on the kind of truck you buy and the number of miles you operate. In general, I should say it is not cheaper to trade in a truck after the first year.

In regard to the best mileage at which to trade, that also depends on the kind of equipment you buy. With a Mack, White, or equipment of like quality, the mileage would be different from that of Fords, Chevrolets or other equipment of that standard.

Equipment should be traded when the cost to operate is unfavorable, when a trade-in proposition looks more favorable than a general overhauling or when the equipment doesn't fit the job for which it was intended.

Depreciation is quite generally figured on a percentage basis, the percentage for the first year being much heavier than for the following years. Some firms use 30 per cent for three years and 10 per cent for the fourth year. Depreciation on the mileage basis is used by some and appears to be the better, but it does have disadvantages, especially when the yearly mileage is not very great.

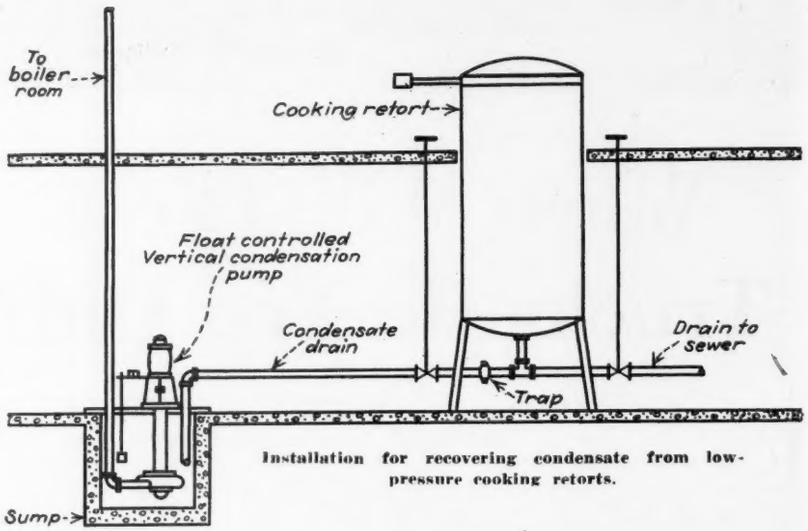
Neither method of depreciation (mileage or yearly) is suitable. It ought to be a combination of the two, and some day somebody will figure out such a combination that will more equitably cover this problem of depreciation on trucks and commercial cars.—A. E. HANSEN, *Libby, McNeill & Libby, Chicago.*

The PLANT NOTEBOOK

Recovering Condensates from Low Pressure Retorts

It is a common practice in many food processing plants to waste the water of condensation from cooking retorts. In many instances the reason for this waste is lack of knowledge as to the value both of its heat content and its effect on boiler operation and maintenance. When pure water of condensation is returned to the boiler, less raw or softened water is required. This decreases troubles from scale formation and the excessive concentrations of soluble and suspended impurities that cause priming and foaming. Less boiler compound is needed and it is not necessary to blow down the boiler so often.

In other instances, condensate is wasted because gravity drainage back to the boiler room is impossible. One large plant solved the problem of returning condensate from a battery of 42 retorts whose bottoms were set very close to the basement floor by building a sump and installing a float controlled vertical condensation pump as shown in the sketch. Cooling of the canned product is normally done in an external cooling tank. When cooling is done in the retorts the condensate line valve is closed after cooking is completed and cold raw water is circulated by means of piping provided for this purpose. This water is wasted unless there is a demand for warm raw water in the boiler.—S. H. COLEMAN, *Roanoke, Va.*



Installation for recovering condensate from low-pressure cooking retorts.

Measurement of pH

Recently an improved type of electrode for use in the measuring of pH was developed by Arthur R. Riddle of the Australian Council for Scientific and Industrial Research. It is claimed that erroneous readings are likely to occur in making pH measurements by using the double quinhydrone electrode where platinum or gold ends are sealed into glass. These troubles usually arise through difficulties with the glass through the heating involved in the cleaning of the platinum or gold by using hot chromic acid solution, by boiling in 50 per cent nitric acid, or by flaming. The development of cracks in the glass tends to make the electrode unreliable or useless.

In the Council's laboratory devoted to the work of the Section of Food Preservation and Transport, a glass-free electrode has been developed which has none of the disadvantages of the glass enclosed type. Twenty cm. of 3 mm. bronze welding rod was covered with a sheath of insulating cotton tubing. This tubing was slipped on over the bronze rod immediately after it was coated with shellac. At each end about 5 mm. of the tubing was cut away and the exposed metal ends cleaned for the fitting of the metal parts of two porcelain connectors. At one end the connecting wire to the potentiometer was screwed in and the electrode end at the other. Fine platinum, about 1 cm. square and 0.25 mm. thick was used for the electrode ends and to them was welded platinum wire approximately 5 cm. long and 1 mm. in diameter. Some were made with the wire normal to the platinum end and others with the wire and the end in approximately the same plane.

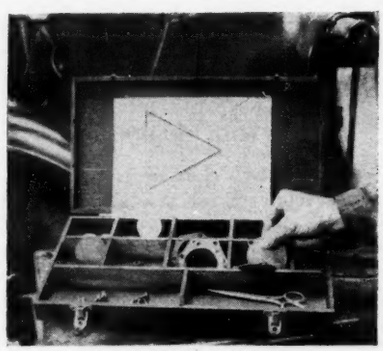
After the electrode has been used a screw may be loosened for removal of the whole of the platinum for cleaning. Only a few seconds is required for the replacement of the platinum in the holder and the length of the platinum wire is enough to allow complete immersion of the metal end of the electrode without any danger of the solution under test wetting the connector.

It is claimed that readings of the pH of carefully prepared buffer solutions made with this electrode have always been quite accurate.—A. P. CHILD, *Kansas City, Mo.*

Repair Kit For Air Pressure Regulators

To avoid losing time when an air pressure regulator gasket or diaphragm blows out, we accumulate a few of the small parts needed to repair them.

Besides the parts damaged in ordinary use it is not uncommon for a new and inexperienced person to try to shut off the air by screwing in on the regulator when it should be turned out. When the latter trouble occurs it may mean a new spring, a valve seat, either large or small socket washers, screws, or other parts.



Repair kit for air pressure regulators.

The best and surest way of keeping production moving is by having a small kit like that shown in the photograph on hand, so that repairs can be made in a few minutes.—BILLIE BURGAN, *San Diego, Calif.*

Anticipated and Unexpected Peak Steam Demands

Everything possible should be done to keep steam consumption as much on an even basis as possible, for this is undoubtedly the most efficient basis. On the other hand, it must be admitted that this cannot completely be done, and there are some places where highly variable demand cannot be dodged.

However, there is always one thing

that can be done to improve a condition of this kind. Those in the plant who use steam for various types of processing purposes can usually tell a little while in advance when an exceptionally heavy demand is about to develop. One can anticipate requirements in this way quite accurately after he has been watching specific processes and pieces of equipment with that end in view. It should be the responsibility of someone to advise the boiler operator when a heavy demand is just ahead.

Such advance information to the operator allows him to step up steam production in advance, gives him time to start up another boiler if necessary, or to take whatever steps may be necessary. If this is done there will be greater efficiency all around, less error in judgment on the part of boiler operators, and less smoke boiling from the stacks as a result of having to step things up too quickly and too radically. Instead, the output can be brought up gradually and efficiently to assume and to carry the added load as it develops.

—JOHN W. HYLER, *Peoria, Ill.*

Lighting for Grading Fruit

At the plant of Nevins Fruit Company, Titusville, Fla., the pack throughout the orange season averages some 2,000 boxes or five carloads per nine hour day. This means that some 400,000 individual oranges per day pass along the grading belt, to be divided according to strict specifications into the three standard grades No. 1, 2 and 3, on the basis of color, finish and the absence of minute surface imperfections. In addition, fruit showing any sign of injury, decay or other major imperfections must be diverted from the packing lines. Thus the entire surface of every orange must receive the scrutiny and experienced judgment of one of the graders if the standards are to be accurately maintained.

The main grading unit for oranges is a roller conveyor, 18 ft. long and 2 ft. wide, normally manned by five graders. Directly behind the conveyor are chutes leading to separate packing lines for fruit of the three standard grades, so arranged that the graders can easily direct the fruit to the proper chute. Accurate sizing is accomplished automatically as the oranges are shunted along the three packing lines. Actually, the grading is an elimination process, the No. 3 oranges being diverted off the conveyor at the start, the No. 2 oranges next and the No. 1 grade travelling almost the full length of the belt. Culls removed by the graders are carried off on a small auxiliary conveyor belt.

At maximum loading, each of the five graders has some 120 oranges before him at a time, moving along from right to left at about 0.6 ft. per sec. At this speed, about eighteen new oranges per second are constantly coming into view, each rotating several times during the 6 seconds or so that it remains within each individual operating position.

Because the grading unit forms an integral part of the continuous conveyor system in the packing plant, it is impracticable to locate it for satisfactory illumination by daylight. The roof of the plant must overhang the loading platform, reducing sidewall lighting to a negligible amount, and even skylights of practical dimensions do not provide the required illumination level. Consequently, artificial lighting mounted directly over the grading conveyor has been generally utilized to maintain the necessary level of illumination.

Until a few months ago, the lighting system at the Nevins plant consisted of seven 100 watt incandescent lamps in shallow RLM reflectors hung 2 or 3 ft. above the working plane.

In the effort to provide the graders with seeing conditions satisfactory to each individual, the drop cords were adjusted up and down to correspond to their heights and preferences. Under these conditions the illumination level was found to vary from below 50 to almost 150 foot-candles across the working plane. Despite the high average of this level, complaints of eye-fatigue on the part of the graders were frequent and serious.

The "up-and-down" arrangement of the shallow reflector units caused direct glare in the eyes of the shorter graders and the whole effect was spotty and uneven. Particularly serious from the standpoint of eye-fatigue were the bright points of reflected glare from the polished surfaces of the oranges. Finally, in contrast to daylight, the color characteristics of incandescent light tended to minimize, rather than emphasize, the red-brown imperfections on the orange skins. All in all, a definite let-down in the speed and accuracy of grading by 2:30 or 3 o'clock each afternoon was accepted as an inevitable consequence of eye fatigue.

The system of illumination now installed comprises three "mercury-incandescent" units supplied by the General Electric Vapor Lamp Co., each equipped with a mercury vapor tube operating at 275 watts and four 150-watts lamps or a total of 875 watts per unit. They are mounted parallel to and directly above the grading belt, with a distance of 39 in. between the bottom of the diffusing channel and the working plane. The units themselves are 3 ft. in length and are mounted 18 in. apart, end to end. They are of the "artificial skylight" type which combines the light of the mercury tube and incandescent lamps above an angular channel of diffusion glass. The actual illumination level, as measured after weeks of service, is a uniform 120 foot-candles throughout.

Strangely enough, the installation of the new units did not meet with "immediate success." At the start, the number of top-grade oranges apparently took a phenomenal drop to about 50 per cent of the previous volume. Actually, the higher visual standards resulting from the new lighting gave an unaccustomed emphasis to minute imperfections that had formerly been invisible or ignored by the graders. After two or three days work under the new lighting, however, the graders easily "re-educated" their standards of judgment. In the same way, graders grown accustomed to observe the fruit under incandescent light at first objected to the "whiter" effect of the combination unit, claiming that the fruit looked "too greenish." This objection, too, was found to be temporary, the graders later finding that slight color variations were more easily detected under the "synthetic daylight" of the combination units.

So far as the primary result of the new lighting system is concerned, however, the effect has not "worn off" after more than three months of operation.—W. J. SUCHORS, *Florida Power & Light Company, Daytona Beach, Fla.*

Lighting installation for grading fruit.

New DISCOVERIES AND INVENTIONS

METHODS OF PRESERVATION

Powdered Potatoes

POTATOES are preserved by drying and powdering them in a condition in which the starch remains substantially in its original form. As described in British Patent 457,088 (granted Feb. 11, 1937 to M. Bunimovitch and A. Faitelowitz, 7 Rue de Bellevue, Suresnes (Seine), France), the drying and powdering are effected by cooking the peeled potatoes in open baskets or perforated trays at a temperature no greater than that of boiling water, cutting into small pieces, drying at the same or no greater temperature until not more than 60 per cent of the water is driven off. This is followed by powdering, and completing the drying at a temperature not much above 175 deg. F.

This final drying of the moist powder is not allowed to carry the moisture content below about 10 per cent. The same treatment may be employed for preserving other starchy vegetables. Potato powder made according to this invention can be used in making mashed potatoes, soups and other products, cooked with water or milk. In the first cooking operation, in which the potatoes are not immersed in water but are exposed to the steam, a pressure vessel may be used but the temperature must not be allowed to exceed about 220 deg. F.

Preserving Fruits and Vegetables By Decreasing Oxygen in Air

FRUITS such as oranges, pears, apples, grapes, peaches and passion fruit can be preserved by keeping them in an atmosphere in which oxygen content, temperature and humidity are carefully controlled. The atmosphere is sterilized to prevent contamination of the fruit with air-born micro-organisms or their spores which might cause spoilage. The atmosphere which is employed contains less oxygen than ordinary air, and relatively more nitrogen. Such an atmosphere is conveniently and inexpensively prepared by passing air over hot copper gauze or turnings. The temperature of the copper and the volume and velocity of the air may be adjusted according to the desired oxygen content, which may be from 2 to 15 per cent. The relative humidity of the partially deoxygenated air, as it is passed through the storage chamber, should be 85-95 per cent.

The storage temperature need not be very low; the optimum temperature is different for different fruits and also depends on the humidity and oxygen content of the treated atmosphere. In general the temperature need not be lower than 35 deg. F. and should not be higher than 70 deg. F. As disclosed in British Patent 457, 888 (granted March 4, 1937 to T. A. Robertson, 4 Russell St., Vaucluse (Sydney), Australia), this preservative atmosphere is used by circulating it continuously around the fruit, withdrawing and renewing the atmosphere as needed. After the copper is spent it can be regenerated by heating in coal gas or methyl alcohol vapor.

Preserving Eggs

IN A COMPARATIVE TEST of cold storage with wet and dry preservatives, for carrying eggs over from the laying season to winter, the losses by evaporation (drying out) and by bacterial spoilage were measured. The smallest total loss was 0.8 per cent. (no drying out, 0.8 per cent bacterial spoilage) with wet preservatives, but this superiority is partly lost in breakage due to sticking where one egg touches another. The highest evaporation loss was observed with one of the dry preservatives (hydroxyethylcellulose), showing 13.9 per cent loss whereas bacterial spoilage was only 6.7 per cent.

The highest bacterial spoilage was with a mineral oil preservative in paste form, on uncleaned eggs, namely 15.5 per cent loss. Cleaned eggs with the same preservative showed no bacterial spoilage, and only 2.4 per cent loss by evaporation. A cellulose ether preservative prevented all bacterial spoilage and allowed only 6 per cent evaporation loss. In the control test (cold storage, six months) the evaporation loss was 5 per cent and the bacterial spoilage 1.5 per cent. In general, for storage periods up to about six months, use of a preservative may be preferable; but for longer storage it is better to rely on cold, aided (if desired) by sealing the eggs in an atmosphere of nitrogen and carbon dioxide. Test results are tabulated.

Digest from "Grading and Preserving Eggs," by Leopold Jirak, *Oesterreichische Chemiker-Zeitung* 40, 117, 1937. (Published in Austria)

VITAMINS

Vitamin C Content of Citrus Hybrid Fruits

TANGELO, Tangor, Limequat, Orangequat, Perrine Lemon are names of citrus hybrids recently developed by the Bureau of Plant Industry, U.S.D.A. Analysis of these fruits for vitamin C (ascorbic acid) shows nothing startling. Tangelos average a trifle less ascorbic acid than oranges and grapefruit. A tangelo is a cross between a tangerine and a grapefruit.

Digest from "Ascorbic Acid Content of a Number of Citrus Fruits," by Daniel and Rutherford *Journal of Agricultural Research*, 54, 689, 1937.

Vitamins A and C In Vegetables

FROM MANY ANALYSES OF VEGETABLES, raised under different conditions, variations in the content of carotin (vitamin A) and ascorbic acid (vitamin C) have been more or less correlated with certain cultivation conditions. Late open air tomatoes had more vitamin C than tomatoes raised under glass for the early market. Keeping spinach in the dark for a time before cutting it lowers its content of both vitamins (A and C) in addition to depriving the leaves of part of their chlorophyll. Excessive liming of the soil tends to make spinach dificient in vitamin A, but the loss can be compensated by providing the plants with magnesium.

In general, liberal fertilization during the growing season is favorable both to vitamin A and vitamin C in a variety of vegetables, e.g. cauliflower, Brussels

sprouts, carrots, leeks, endive, cabbage, tomatoes, beets and others. In particular, soils poor in N or in Mg are unfavorable and these deficiencies should be made up if vegetables with good vitamin potency are desired. Vitamin C is not so sensitive to soil deficiencies as Vitamin A, but this does not mean that properly fertilized soil is a negligible factor in connection with vitamin C. Frost damage does not seem to be injurious to vitamin A content in vegetables. No statement is made as to the effect of frost damage on vitamin C content.

Digest from "Influence of Nurture on Carotin and Ascorbic Acid Content of Vegetables and Feed Crops," by C. Pfaff and G. Pfützer, *Angewandte Chemie*, 50, 179, 1937. (Published in Germany)

BAKING

Bakers' Yeast From Oil Seed Press Cake

A NEW NUTRIENT MEDIUM for the manufacture of yeast for bakeries is made from an oil seed cake extract. As disclosed in German Patent 643,339 (granted April 5, 1937 to Hans Braasch and Arnold Braasch, Neumünster, Germany) the extract is made by treating oil seed cake (or other materials with high protein content) with a strong inorganic acid. Sulphuric acid in strengths from 20 to 30 deg. Be. is effective. The seed cake is wetted with the acid, well pressed down in a container, and allowed to stand several days at ordinary temperature. It is then diluted with water, boiled two hours, cooled, and neutralized down to a mere trace of acidity. The liquid is separated from the undissolved matter. During the boiling operation, the fats and their decomposition products should be driven off as completely as possible. Liquids prepared in this way have a sufficient concentration of hydrolyzed protein to serve as nutrient for selected strains of yeast.

New Theory of Bread Staling

COMPARISON OF THE X-RAY PATTERNS given by stale bread and by starch pastes after dehydration with alcohol is interesting because it gives some indication of the changes occurring as bread becomes stale. When the X-ray diagrams were first studied in 1930, two types were observed, called the V-pattern and the B-pattern. Fresh bread gives a V-pattern: stale bread begins to show a B-pattern. At that time they were interpreted as being due to different crystalline forms of starch. Since bread contains about nine times as much starch as gluten, its X-ray diagram may be interpreted as a starch diagram, and so it was concluded that staling of bread is due mainly to a change in the crystalline form of starch granules.

Since 1930 many hundreds of the starch diagrams have been examined, and as increasing knowledge has made interpretation more definite and certain it has become increasingly evident that the original conclusion about staling of bread was in error. The V-pattern has sharply defined concentric rings and a diffuse darkening over these rings. In the B-pattern the rings are also sharply defined, but the diffuse darkening becomes weaker or disappears. It now appears that the V-pattern represents a starch in which some components are crystalline, others amorphous, while in the B-pattern the amorphous starch is disappearing.

Hence, the new theory of staling in bread is that the starch changes, not from one crystalline form to another, but from an amorphous substance to crystalline starch. Much research is still needed to explain how and why this change causes bread to stale.

Digest from "The Amorphous Part of Starch in Fresh Bread," by J. R. Katz, *Recueil des Travaux Chimiques des Pays-Bas* 56, 785, 1937. (Published in Holland.)

DAIRY PRODUCTS

Pasteurized Milk

THE STRICT COMPULSORY PASTEURIZATION LAW, passed in France two years ago, raised the question as to whether nutritive value of the milk suffers from the prescribed treatment. An experimental program was therefore undertaken to settle the question. Pasteurization was carried out under regular dairy conditions, in a concentric tube pasteurizer in which the milk, in a layer 5 mm. (about 0.2 in.) thick in the annular space between the tubes is heated, in absence of air, from only one side of the annular space. Pasteurization temperature (80 deg. C. or 176 deg. F. in some tests, 90 deg. C. or 194 deg. F. in others) was attained in 36 seconds.

Nutrition tests were made with rats, in two series (one to test vitamin potency, the other to test overall nutritive value). Growth curves for the rats fed on pasteurized milk, as compared with those receiving raw milk, show no significant difference either in

(*Turn to page 619*)

Picked Up at Meeting of American Chemical Society

» WHETHER SPINACH is raw, cooked, frozen or canned, its vitamin A content remains constant. A small part of the vitamin C may be lost but most of it remains after freezing or canning. All of it is lost by drying.—C. R. FELLERS, *Massachusetts State College.*

» ALTHOUGH CARBON DIOXIDE retards the rate of respiration and preserves the appearance of asparagus tissue, it will bring about destruction of the vitamin C at any temperature tested between 35.6 and 80.6 deg. F. When stored in carbon dioxide of between 30 and 60 per cent concentration, asparagus will lose 60 per cent of its vitamin C in five hours.—NORWOOD C. THORNTON, *Boyce Thompson Institute for Plant Research.*

» AN ENZYME IN TOMATOES, pectinmethoxylase, is so powerful that complete transformation of the tomato pectin to pectic acid will take place in four minutes after cold tomatoes are pulped. Hence the "hot break," or preheating before pulping, is desirable to preserve viscosity of tomato products.—Z. I. KERTESZ, *New York State Agricultural Experiment Station.*

» A PINT OF MILK A DAY, not a quart as sometimes claimed, is all that a well nourished child of 3½ to five years of age needs to supply his calcium requirements.—JULIA OUTHOUSE, *et al; University of Illinois.*

» BLEACHING ADSORBENTS for purifying vegetable oil should be selected so that they do not leave the oil in such a condition that it will go "off" even if it is free from objectionable taste and odor after refining.—JOHN HASSLER, *West Virginia Pulp and Paper Co.*

» A POUND of cured Cheddar cheese contains about the same amount of vitamin A as a pound of fresh cheese, the loss of the vitamin during the cure being about compensated by the shrinkage by drying.—R. ADAMS DUTCHER, *Pennsylvania State College.*

» HAMS, cured with 75-deg. pickle, cured in eight days per inch of thickness; those in 85-deg. pickle required seven days per inch in experiments which produced hams that averaged 10.29 per cent salt *vs.* 14.58 per cent salt in commercial hams. To get the same salt content as commercial hams required nine days per inch in 85 deg. pickle.—MILLER AND ZIEGLER, *Pennsylvania State College.*

» COWS' MILK in Roquefort cheese, which should be made from sheep's milk, can be detected by serological precipitation tests.—COHEN AND SOBEL, *Jewish Hospital, Brooklyn.*

Food Equipment News

REVIEW OF FOOD PROCESSING EQUIPMENT, ACCESSORIES, AND SUPPLIES

Refrigerated Distribution Units

KELVINATOR DIVISION, Nash-Kelvinator Corp., Detroit, Mich., is now making a complete line of refrigerated cases and "reach-in" refrigerators for stores, including a mechanical "reach-in" refrigerated display case for fresh fish.

The cases come in 7, 9 and 11 foot lengths and in a sufficient variety of models to fill all standard requirements of butchers, grocers, and other food merchants. A specialty in the line is an all-purpose case designed for dairy stores and other small stores.

The line of "reach-in" refrigerators comes in sizes that are most frequently in demand. It features the "self-contained" type unit, with condensing unit contained in the refrigerator.

The fish refrigeration units operate by the "Chil-Spray" system, which has the advantage of maintaining the correct relative humidity for the proper preservation of the fish, and also preserves the natural protective film which occurs on the skin of all fishes.

Reversing Motor Starter

ALLIS-CHALMERS MFG. Co., Condit Works, Boston, Mass., has brought out Type AP-7-R reversing motor starter. It is furnished for 7½ hp., 550 volts, or less. It consists of two units, mechanically interlocked so that either unit cannot be closed if the other is closed. The units are equipped with "Ruptors," consisting of enclosing chambers which confine and depotentiate the arc formed by circuit interruption. These increase the interrupting ability of the contacts and form individual isolating barriers between contacts of opposite polarity.

Other features include large silver double break contacts; solenoid operated vertical make and break; unit construction; true contact alignment; enclosed temperature overload relays giving positive motor protection; and inherently provided under-voltage protection.

Slicer Blades

FLOYD W. KUNSMAN, 210 Cedar St., Reading, Pa., is marketing "Razor Steel" slicing blades for bread slicers. These blades are said to be five points harder than blades of ordinary cutlery steel, to slice twice as many loaves before resharpening, and to permit four more resharpenings.

Coating & Cooling Units

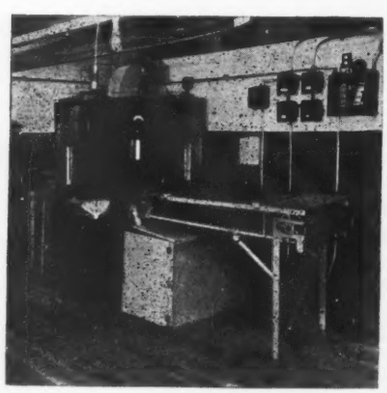
RAPID, STRAIGHT-LINE PRODUCTION of chocolate coated doughnuts, cakes and confections is the object of the "wizard" coating and cooling units made by Ben Moore Mfg. Co., 220 Essex Street, Brooklyn, N. Y. This equipment is said to take but seven minutes from feeder to packer. In this time the product is coated, cooled and made ready to pack, with a high-gloss finish and mirror-like bottom.

The equipment consists of coater, cooling tunnel, chocolate melting kettle and electrically controlled tempering kettle. It is shown in the two accompanying photographs. A feature is that the cooling equipment can be adapted to any other make of coater. The capacity of the equipment depends on the length of the tunnel. One bakery, equipped with a 30 ft. tunnel, produces from 500 to 600 dozen chocolate coated doughnuts per hour.

Water Still

BARNSTEAD STILL & STERILIZER CO., 101 Lanesville Terrace, Forest Hills, Boston, Mass., has recently redesigned its large industrial water stills. One improvement is an evaporator trap door, on which the steam heating coil is mounted, making cleaning of the evaporator considerably easier. When this door is unbolted and swung open, the operator has free access both to the interior of the evaporator and to the coil.

Designed to handle water of the highest mineral content, these stills have

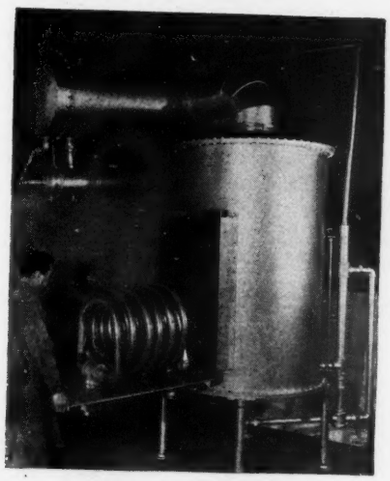


Unit for coating doughnuts, cakes and confections with chocolate.

Cooling tunnel for chocolate coated products.

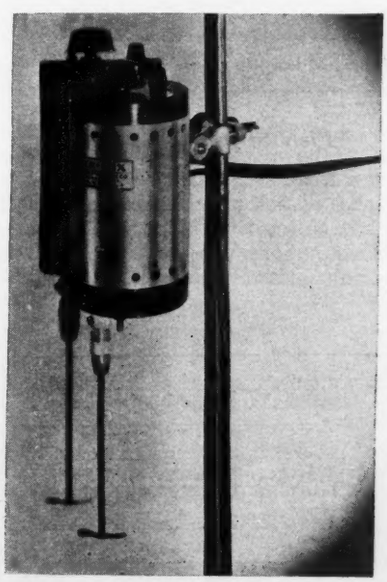
extra-high evaporators which prevent foaming over, and a constant bleeding device which deconcentrates the mineral contents in the evaporator water, preventing rapid scale formation.

Another new feature is the quick-demountable condenser which can be taken down for cleaning by any worker. This makes possible keeping the pipes carrying the condensing water free from dirt and scale, and efficiently operating at all times.



Industrial water still.

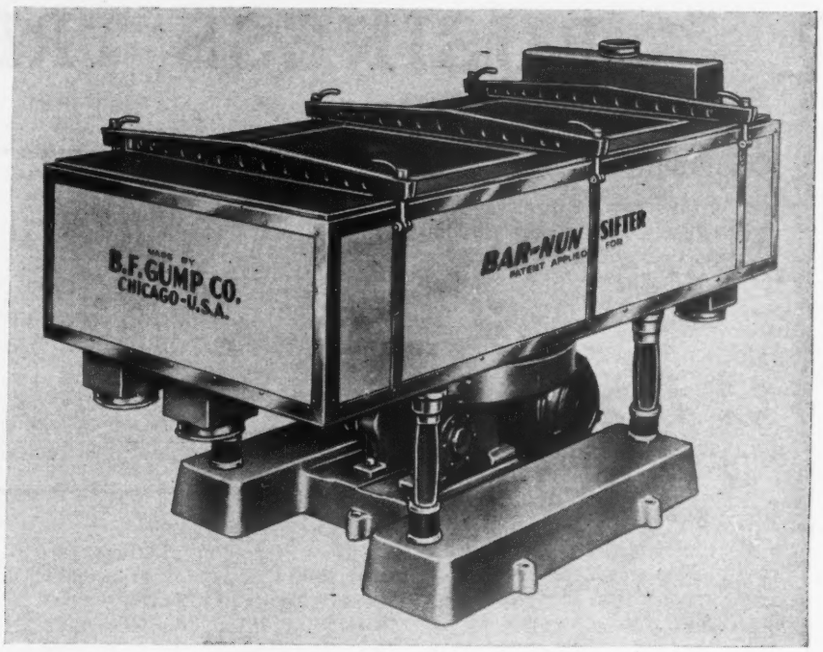
The new features are on stills of 50 gal. per hour capacity and over.



Laboratory mixer.

Laboratory Mixer

"POWER-MIX" is the trade name of a laboratory mixer recently brought out by Laboratory Equipment Co., 146 Lafayette Street, New York, N. Y. Features of this device are finger-tip control of speed, laminated-plastic silent gears, and plastic covers to shield the motor ends.



Rotary sifter, separator or grader.

Rotary Sifter

B. F. GUMP Co., 538 So. Clinton Street, Chicago, Ill., recently announced a rotary motion sifting unit called the "Bar-Nun" sifter. Designed principally for sifting and rebolting flour and other powdery materials, the sifter can also be used for scalping, grading and separating many kinds of dry and granulated materials.

The makers claim that the mechanically controlled, complete rotary motion of the entire sieve area produces exceptionally large capacity per square foot of the silk or wire bolting cloth. Complete separation of tailings and finished product is said to be obtained on each individual sieve. Other features include easy accessibility for cleaning, and interchangeable sieves to suit the product handled.

This sifter is driven by a fractional horsepower motor. It is furnished either 1, 2 or 3 sieves deep for sifting and rebolting, and from 2 to 5 sieves deep for separating or grading. Screen areas furnished are 20x30 in., 30x50 in., and 40x60 in. Approximate overall height is 3½ ft.

Fan Cooled Motors

WESTINGHOUSE ELECTRIC & MANUFACTURING Co., East Pittsburgh, Pa. has developed in Type CS a line of dual ventilated fan cooled squirrel cage motors. These are designed for use in packing plants and other industrial services where conditions are severe.

In these motors, the frame contains two sets of air ducts, one internal, the other external. The internal ducts are open in the interior part of the motor, the external ducts on the outside of the frame.

These two sets of ducts are separated by a common wall and cooling is on the heat exchanger principle.

Air Compressors

WORTHINGTON PUMP & MACHINERY CORP., Harrison, N.J., has developed a line of tank-mounted air compressors for general service. Single stage units are vertical, with motors from ¼ to 5 hp., and with displacements from 1.43 to 67 cu.ft. per minute at a maximum pressure of 250 lb. per sq.in.

Two-stage units are available with angle-type compressors, with motors from ¾ to 10 hp., and with displacements from 3.9 to 45 cu.ft. per minute at maximum pressures of 250 lb. per sq.in.

Insulated Cable

GENERAL ELECTRIC Co., Schenectady, N. Y., has recently introduced a new synthetic insulating compound called "Flamenol." This has characteristics similar to rubber, but contains no rubber and will not support combustion. It is used, among other things, for insulating electric conducting cables, in which use it resists moisture, acids, alkalis and oils.

Totally Inclosed Motor

FOR USE in locations where electric motors are exposed to explosive dusts, gases, or corrosive conditions, Wagner Electric Co., St. Louis, Mo., has brought out its new line of Type CP motors. These units are totally inclosed, fan-cooled, and sealed.

BUSINESS TRENDS

Commodities Steady

IN SPITE OF THE RECENT DROP in the stock market, commodity spot prices in mid-September were holding firmly to the gains made during the three preceding weeks. Apparently, the low point for food commodities came in August, with a rise occurring between the third week of that month and the second week of September. Professor Irving Fisher's index number for commodity prices (1926—100) was 91.2 for the first week of the month, compared to 91 for the preceding week and 91.9 for the month previous.

In the period from Aug. 21 to Sept. 11, the *N. Y. Journal of Commerce* price index number for food commodities rose from 82.6 to 84.6 (1927-1929—100), while the general commodity price index number from the same source rose from 88.4 to 89.5.

With ample supplies of most food materials available because of ample harvests, and only meat supplies in a really restricted condition, it is not likely that the general level of food prices will change much during the early fall, in spite of the upward tendency evident in September.

Smaller Egg Supplies

BECAUSE OF the great reduction in the number of young chickens this year, the prospect is for smaller laying flocks in 1938 and consequently for smaller egg supplies. While the number of eggs in storage is high at the present time, smaller egg production during the fall is expected to hold prices at about the 1936 level. After the first of the year, egg prices are expected to go higher than in the early winter of 1937.

Construction News

	Pending (thousands)	Awarded September (thousands)	Total Awarded 1937 (thousands)
Bakery	.....	$265	$1,159
Beverages	$770	150	7,759
Canning and Preserving	155	110	1,315
Confectionery	.....	.....	40
Grain Mill Products	270	40	745
Ice Manufactured	.....	.....	3,486
Meats and Meat Products	73	.....	1,398
Milk Products	80	40	4,798
Miscellaneous	295	676	9,752
	$1,643	$1,281	$30,452

Stocks of poultry in storage are also large, but this is not expected to depress prices, as lower supplies are looked for throughout the fall. The more favorable price of feed, as well as the relatively small flocks, should act to hold poultry off the market to some extent.

Meat Supplies and Prices

BOTH CATTLE AND HOGS brought prices in September that were higher than at any time since just after the World War. At the same time, the number of animals marketed remains low and the prospects are that the seasonal increase in marketings will not be as great this fall as last. With fewer animals available on farms, and the supply of feed ample and lower in price, the natural tendency will be to hold more animals on farms.

While such a course will, in a year or so, result in building up the depleted numbers of meat animals and hence increase the potential meat supply, for the present it means restricted meat supplies and high prices, both wholesale and to the consumer. The question naturally arises as to what affect this price situation is likely to have on meat consumption, particularly in view of consumer resistance to higher meat prices noted in these pages last month. Some light is thrown on this matter by a table published by the United States Department of Agriculture in the September, 1937, issue of *The Agricultural Situation,* and reproduced herewith.

Index Numbers Relating to Meat Prices and Consumption of Meats

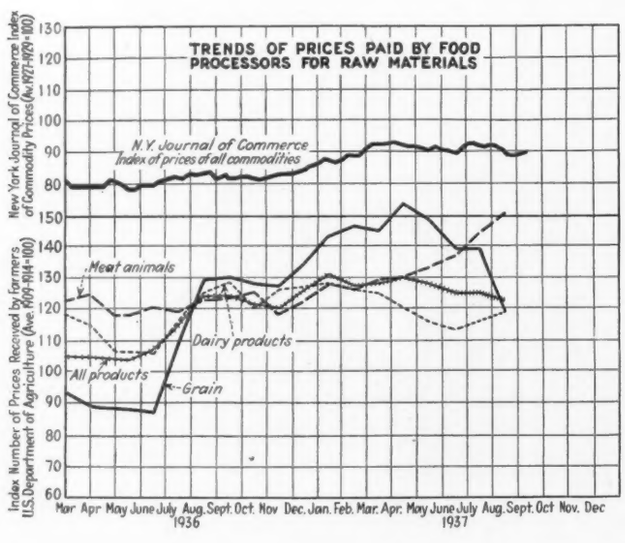
(1924–1925 — 100)

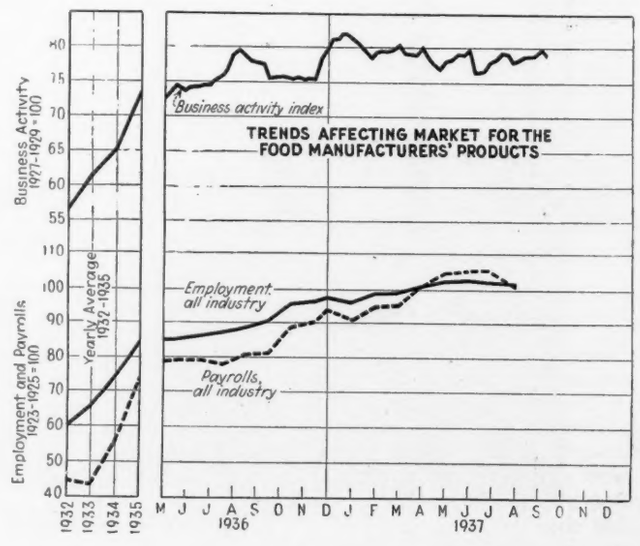
Period	Retail Prices of meat New York City[1]			U. S. consumption of federally inspected meats including lard	Retail value of consumption of federally inspected meats[3]	Non-agricultural income[4]
	Beef	Lamb	Pork[2]			
1928	112.5	104.1	97.6	100.5	104.7	104.1
1929	111.4	100.2	94.7	100.8	102.7	107.0
1930	98.1	80.2	89.2	98.0	90.9	100.4
1931	83.3	66.8	72.1	99.4	76.2	85.3
1932	71.6	55.2	56.1	98.0	60.8	67.6
1933	58.9	50.1	50.4	103.0	55.7	63.0
1934	63.8	56.6	62.7	101.5	64.3	71.9
1935	83.4	62.9	92.8	84.4	73.2	77.0
1936	77.5	66.9	90.8	96.5	80.5	87.0
Jan.–June, 1936	77.4	67.2	91.5	91.2	76.4	83.0
Jan.–June, 1937	80.3	65.8	86.3	92.8	76.8	95.4

[1] Composite prices weighted according to proportion of cuts and products in good grade carcasses.
[2] Major hog products, including lard.
[3] Computed from retail prices of good grade meats at New York City and apparent consumption in the U.S. of federally inspected meats, including lard.
[4] Agricultural Adjustment Administration.

Fish Supplies Lower

AFTER SOME TWO YEARS of high output, supplies of fish have turned downward, at least for a time. The most recently released figures for fishery landings show that New England ports recorded


TRENDS OF PRICES PAID BY FOOD PROCESSORS FOR RAW MATERIALS
New York Journal of Commerce Index of Commodity Prices (Av. 1927-1929=100)
N.Y. Journal of Commerce Index of prices of all commodities
Index Number of Prices Received by Farmers U.S. Department of Agriculture (Ave. 1909-1914=100)
Meat animals
Dairy products
All products
Grain
Mar Apr May June July Aug. Sept. Oct Nov Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct Nov. Dec
1936
1937



Business Better

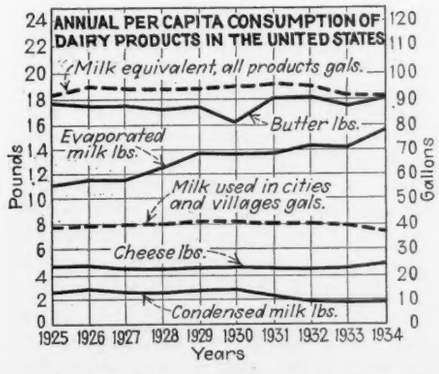
SUMMER STAGNATION seemed to leave business, with the passing of Labor Day, and both prices and volume have picked up since, although not nearly so much as the optimists had expected. In the five weeks from Aug. 14 to Sept 18, the *Business Week* Index of business activity fell slightly, registering a decrease of 2.79 per cent.

A month of vacation from Congressional activity combined with the natural fall business upturn to bring improvement to many lines, in spite of the braking action of European and Asiatic warlike disturbances. Automobile makers went into volume production on 1938 models. Steel started a comeback from the Labor Day low point. Electric power production crashed through to a new all-time high. And construction maintained a fair pace. Harvests were large, fulfilling the promise of earlier predictions. The stock market slump of early September was the only seriously disturbing domestic occurrence, and business is wondering what influence this may have.

Wholesale prices of all commodities, as reported by the U. S. Department of Labor, decreased 0.80 per cent for the four weeks from Aug. 14 to Sept. 11. For farm products this index fell 3.42 per cent, and for food it increased 0.11 per cent in the same period. In contrast, the *New York Journal of Commerce* weighted commodity price indexes all rose, the general index gaining 2.26 per cent from Aug. 21 to Sept. 18, the grain index rising 5.83 per cent and the food index increasing 5.93 per cent in the same period.

34,742,000 lb. in July, compared to 38,354,000 lb. in July, 1936, a decrease of 9 per cent.

At the same time, a report of fishery products held in cold storage on Aug. 15, 1937, shows a decrease of 13 per cent over the same date a year ago. Holdings on Aug. 15, 1937 were 66,209,000 lb.; on Aug. 15, 1936, were 76,076,000 lb.; and the five-year average for the date is 59,410,000 lb.


ANNUAL PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN THE UNITED STATES
Milk equivalent, all products gals.
Butter lbs.
Evaporated milk lbs.
Milk used in cities and villages gals.
Cheese lbs.
Condensed milk lbs.
Pounds
Gallons
Years
1925 1926 1927 1928 1929 1930 1931 1932 1933 1934

Prices received by farmers are from the U. S. Department of Agriculture. Employment, payrolls, wholesale prices and retail prices from the U. S. Department of Labor. The business activity index is that of *The Business Week*. The cost of living index is from the National Industrial Conference Board. The data on consumption of dairy products are from the Bureau of Agricultural Economics, U. S. Department of Agriculture.

Salmon Pack Average

IN SPITE OF EARLIER MISGIVINGS concerning the size of the pack of canned salmon, 1937 will apparently see at least an average output of this food.

Estimates made in mid-September indicate a total for distribution, including a carryover from last year of 199,355 cases, of 6,670,851 cases. This number compares to 9,323,089 cases packed in 1936, so that this year's output is 2,652,238 cases below the 1936 record pack. It is also 1,452,883 cases below estimated actual consumption of canned salmon in 1936. However, the pack is very close to the average output of the last five years, and may be considered as a normal pack.

Most of the shortage evident is in the pack of Alaska pink salmon. The output of the higher quality red product is close to that realized last year.

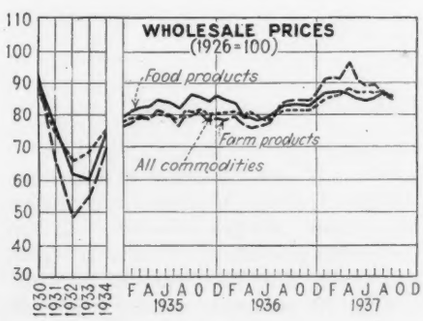
Crops Average or Better

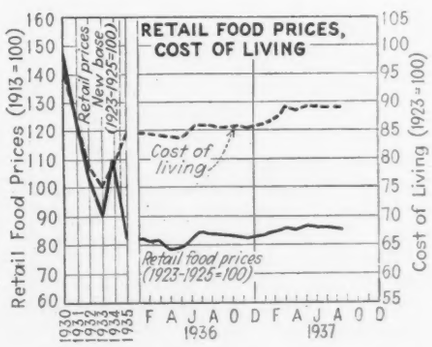
INFORMATION AVAILABLE during the past month indicates that most of the important food crops of the United States will have yields this year equaling or bettering the 1928-1932 five year average. Some of the more important are estimated for this year as follows:

Crop	1937 Estimate	1928-32 Average
Corn	2,549,000,000 bu.	2,554,000,000 bu.
Wheat	885,000,000 bu.	864,000,000 bu.
Oats	1,136,000,000 bu.	1,215,000,000 bu.
Barley	226,000,000 bu.	281,000,000 bu.
Rye	51,000,000 bu.	38,000,000 bu.
Rice	51,000,000 bu.	42,000,000 bu.
Potatoes	403,000,000 bu.	372,000,000 bu.
Sugar Beets	9,000,000 tons	8,000,000 tons
Peanuts	1,258,435,000 bu.	.....
Dry Edible Beans	14,272,000 bags	14,323,000 bgs*
Sweet Potatoes	74,857,000 bu.	66,245,000 bu.
Cranberries	648,100 bbl.	593,023 bbl.
Apples	202,274,000 bu.	160,909,000 bu.†
Peaches	59,018,000 bu.	53,598,000 bu.†
Pears	30,388,000 bu.	25,064,000 bu.†
Grapes	2,517,440 tons	2,054,394 tons†

* Dry edible bean five year average not available; figure given is for 1935.
† 1931–1935 five year average.

Truck crops are also doing well. The late snap bean crop is 228 per cent above the five-year average. Cabbage is up about 22 per cent, and a record late crop of tomatoes, 42 per cent above the 1928-32 average is in prospect.




RETAIL FOOD PRICES, COST OF LIVING
Retail prices New base (1923-1925=100)
Cost of living
Retail food prices (1923-1925=100)
Retail Food Prices (1913=100)
Cost of Living (1923=100)
1930 1931 1932 1933 1934 1935
F A J A O D F A J A O D
1936
1937

INDICATORS

GRAPEFRUIT used for canned grapefruit juice production in Texas in the 1936-37 season totaled 2,563,000 boxes, compared to 619,000 boxes in the preceding canning season.

PEA CANNING output for 1937 is estimated by the National Canners Association to be about 23,400,000 cases, all sizes, compared 16,178,001 cases, all sizes, in 1936.

SNAP BEANS for canning this year are now estimated at 102,600 tons, compared to 76,500 tons last year, and a 1928-32 average of 73,100 tons.

CORN FOR CANNING in 1937 is estimated at 1,087,000 tons, compared with 606,700 tons in 1936, and a 1928-32 average of 628,000 tons.

BUTTER, CREAMERY, in cold storage Sept. 1, 1937, was 132,976,000 lb., compared with 112,106,000 lb. the year before, and a 1932-36 average of 134,433,000 tons.

CHEESE, ALL VARIETIES, in storage Sept. 1, 1937, was 123,264,000 lb., compared with 117,542,000 lb. the year before and a 1932-36 average of 104,755,000 lb.

EGGS IN STORAGE on Sept. 1 1937 totaled 12,967,000 cases, against 10,109,000 cases the year before, and a 1932-36 average of 10,465,000 cases.

POULTRY IN STORAGE on Sept. 1, 1937 was 63,759,000 lb., compared with 65,488,000 lb. the year before, and a 1932-36 average of 44,910,000 lb.

MEAT IN STORAGE on Sept. 1, 1937 was 466,893,000 lb., compared with 560,891,000 lb. the year before, and a 1932-36 average of 645,793,000 lb.

LARD IN STORAGE on Sept. 1, 1937, was 118,756,000 lb. compared with 110,561,000 lb. the year before, and a 1932-36 average of 131,261,000 lb.

DUN & BRADSTREET'S weekly food index on Sept. 14, 1937, stood at $2.89, compared with $2.82 for the corresponding date in 1936.

Keeping Up WITH THE FIELD

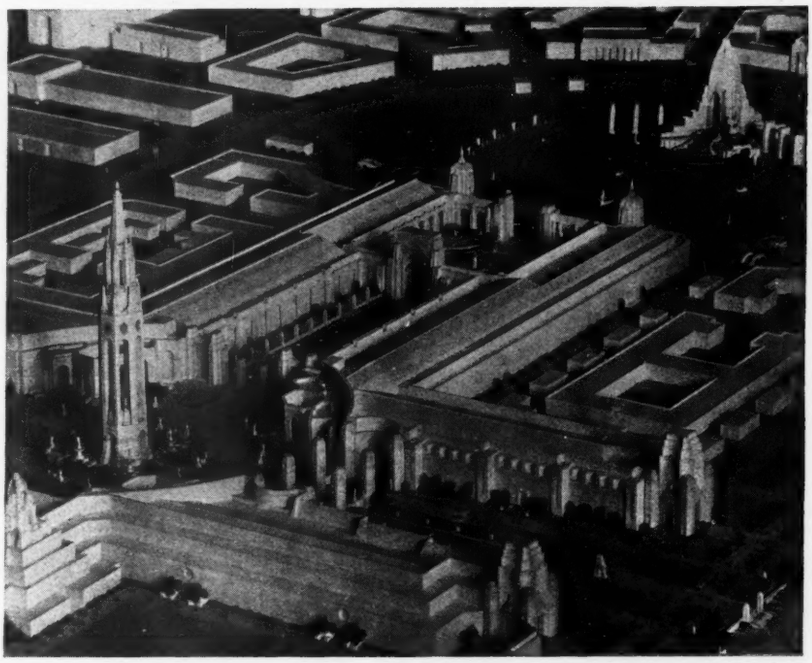
Technology Conference is Big Success — Wallace Announces New Farm Plan—Food-Bill Prospects—Sugar Quotas Established—FTC Accuses Bakers

Food Bill Future

As soon as Congress again goes into session, something is expected to be done about food and drug legislation. And the new bill drawn up and approved by the subcommittee of the House Committee on Interstate and Foreign Commerce just before adjournment is given a big edge on other proposed measures. Consequently, the food, drug and cosmetic industries are examining its provisions carefully.

Known as subcommittee print No. 3, the measure authorizes standards of identity, provides for a single standard of quality for each food, limits multiple seizures and contains better enforcement provisions than S. 5. It makes no provisions relating to advertising, but it is expected that the Lea bill will be passed by the House to give the Federal Trade Commission power to regulate advertising. Of particular interest to the dairy industry is a provision exempting butter, cheese and ice cream from the requirement that artificial coloring must be designated on the label.

In the matter of misbranding, the bill is strict, stating that a food shall be misbranded if its labeling is false or misleading in any particular. As for multiple seizures, another point of much importance to the food industries, this action is permitted only when such misbranding has been the basis of a prior judgment in favor of the United States or when the article is dangerous to health or the labeling is, in a material respect, false, misleading or fraudulent.



GOLDEN GATE PALACE OF FOODS

With 20,000,000 visitors expected at the 1939 Golden Gate International Exposition, to be held on a man-made island in San Francisco Bay, many food manufacturers and distributors have made plans for exhibits, including Leslie Salt Co., Chr. Hansen's Laboratory, California Packing Corp., A. Schilling & Co., J. D. and A. B. Spreckels, Tea Garden Products Co. and H. J. Heinz Corp. The illustration shows models of various buildings, the one behind the tower being that of the Palace of Foods and Beverages.

To Cut Crop Acreage

Following conferences with farm leaders, Secretary Wallace on Sept. 20 announced the 1938 soil-conservation program. Ostensibly a conservation measure, the plan will have the effect of limiting acreage of the soil-depleting cash crops to between 275 and 290 million acres, as compared with the 1928-37 average of 305 million. In practice, the plan will call for the establishment of national, state, county and farm acreage "goals," not only for the soil-depleting crops but also for soil-conserving crops, and payments to farmers will be predicated upon fulfillment of both goals.

By product the acreage goals for soil-depleting crops (exclusive of tobacco) are as follows: corn, 92 to 96 million; cotton, 29 to 31 million; rice, 825 to 875 thousand; peanuts, 1.5 to 1.6 million; and potatoes, 3.1 to 3.3 million. Specific acreages are not given for sugar cane and sugar beets, but these are included in the total acreage for soil-depleting crops.

Bakers Accused by FTC

Striking unexpectedly, the Federal Trade Commission has put Quality Bakers of America, New York, on the carpet for alleged violation of the brokerage provisions of Robinson-Patman Act. The FTC charges also apply to 70 wholesale bakery concerns making up the association, a group of flour manufacturers and a service company, Quality Bakers of America, Inc.

In reply to the FTC complaint, Quality Bakers of America denies that its operations are in violation of the R-P Act, explains the nature and purpose of its functions as "a cooperative organization of nonecompetitive wholesale bakers," sets up six special defenses and asks that the complaint be dismissed. The reply states that the organization is operating a wholly legitimate cooperative, the operation of which, rather than harming competition, stimulates competition by making it possible for small independent wholesale bakers to operate more efficiently, thereby enabling them to meet the competition of large chain stores and consolidated wholesale bakers, and in furnishing a

more economical and efficient method of sales, sales promotion and distribution services for manufacturers and suppliers of bakers' materials. In the first special defense set up by the reply, it is stated that the association, the individual respondents, members and the service company are not engaged in interstate commerce, so that the FTC has no jurisdiction over their activities. Other special defenses hold the R-P Act to be unconstitutional.

Sugar Quotas Set

TOTAL sugar-consumption requirements for the continental United States have been increased by Secretary Wallace under the new sugar act to 7,042,733 short tons. This compares with the 1936 total of 6,812,687 short tons. At the same time, the Secretary set the following quotas for the various areas (short tons, raw value):

Continental beets	1,633,361
Continental cane	442,793
Hawaii	988,551
Puerto Rico	840,954
Virgin Islands	9,396
Philippine Islands	1,085,304
Cuba	2,014,538
Foreign countries other than Cuba	27,610

Of the total 1937 quotas, the following amounts from each area may be brought in as direct-consumption sugar (short tons, raw value):

Cuba	375,000
Philippine Islands	80,214
Puerto Rico	126,033
Territory of Hawaii	29,616

The new sugar act became a law on Sept. 1, when President Roosevelt placed his signature on the controversial measure. But how long it will remain in force is questionable, because the President at the time of signing the act made the statement: "I hope the next session of Congress will consider repealing or shortening the clause which continues the refining monopoly to March 1, 1940."

The first processing tax on a farm product since invalidation of the AA Act is provided under the new law in the form of an excise levy of ½ cent a pound on manufactured sugar. This will cost the industry between $60,000,000 and $70,000,000 a year.

Will Study Rail Rates

SHIPPERS of fruits and vegetables may pay lower freight charges in the near future. The Interstate Commerce Commission has instituted a general investigation of the reasonableness and lawfulness of the charges of all railroads on these commodities from and to all points in the United States. Included in the investigation will be a study of the character, extent and cost of the "protective service against cold," and in addition to the railroads, the investigation will include American Refrigerator Transit Co., Burlington Refrigerator Express Co., Merchants Dispatch, Inc., Western Fruit Express Co. and Fruit Growers Express Co.

Hearings will be held on the freight charges after Jan. 1.

Frosted Foods Expands

ANOTHER big boost is to be given the production of quick-frozen foods by Frosted Foods Sales Co., subsidiary of General Foods Corp., New York. Following the best summer sales in the history of the company, Frosted Foods has decided to increase production by 65 per cent for the current packing season. As part of its expansion program, the company will introduce five new items, enter four new retail sales areas and add several hundred retail dealers before the close of 1937. About half of the new outlets will be in new territories such as Buffalo, Pittsburgh, Cleveland and Chicago.

To increase its output of quick-frozen meats and to place its production facilities close to an ample supply of good quality livestock, Frosted Foods has made arrangements whereby Kingan & Co., Indianapolis, will quick-freeze meat for it. The quick-freezing and packing of meat also will be continued at Boston.

Bakers Lose Tax Suit

APPROXIMATELY $2,000,000 in processing taxes will be retained by Washburn Crosby Co. and not be redistributed among bakers, as the result of a ruling on Sept. 2 by a Federal judge at Kansas City, Mo. Several bakers had jointly sued Washburn Crosby for the recovery of the $1.38 a barrel tax paid on flour under the invalidated AA Act. The judge ruled that the miller held no specific funds in which the bakers had an interest and that under their plain contracts the bakers were not entitled to an accounting.

AAA May Buy Eggs

PREPARED to enter the market at any time, the Government, through AAA, is keeping close tab on the egg market. As yet no definite plans for action have been formulated, but if it is found necessary to purchase supplies to bolster up a sagging price level, both fresh and storage eggs may be bought. It is virtually certain, however, that the chief effort will be directed toward fresh eggs, though it is fully realized that the supply of storage eggs has a very important effect on the prices of fresh eggs. Officials say that if it is found necessary in order to stabilize a sagging market, AAA representatives will stand ready to purchase storage supplies.

Addendum

IN THE ARTICLE, "Automatic Control of Pressure," which appeared in FOOD INDUSTRIES last month, no mention was made of the manufacturer of the subatmospheric-steam system illustrated in Fig. 50. For the benefit of food engineers who want that information, the manufacturer is C. A. Dunham Co.

Mid-September

CAPITAL VIEWS

FOOD LAW—The food and drug bill has been revised by the House subcommittee and, minus the advertising control features, is pending in the main Committee on Interstate and Foreign Commerce. Enactment will not be delayed much longer when Congress reconvenes, Washington believes, as most of the controversial features are now out of the way. Food executives can well study the subcommittee substitute for the original terms of the Copeland bill, and notify their Congressmen during this recess as to changes which they believe to be advisable.

STREAM POLLUTION—The two factions wrangling over the method by which stream pollution should be prevented unexpectedly got together on a

CONVENTIONS

OCTOBER

4–8—Master Brewers Association of America, Milwaukee.
11—New York Section of American Association of Cereal Chemists, Chemists Club, New York.
17-23—American Dietetic Association, John Marshall Hotel, Richmond, Va.
18–20—International Association of Ice Cream Manufacturers, Dallas.
21–23—International Association of Milk Dealers, Dallas.
21–27—Dairy Industries Exposition, Municipal Auditorium, New Orleans.
22–26—Institute of American Meat Packers, Drake Hotel, Chicago.
24–27—American Bakers Association, Municipal Auditorium, Kansas City, Kan.
26–28—United States Brewers Association, Pittsburgh.

NOVEMBER

14–17—New England Bakers Association, fall meeting and exhibit, Statler Hotel, Boston.
15–19—American Bottlers of Carbonated Beverages, convention and exhibit, New Orleans.

new House bill during August. This action materially advances toward enactment a comprehensive federal program, fixing water-quality standards for streams, under the Public Health Service. Although some waiting period before rigid enforcement of these standards is contemplated (three to five years), it is evident that Congress does not intend that navigable waterways and their tributaries shall continue much longer as the dump for industrial-plant wastes. New impetus will be given to waste-disposal research and the building of improved effluent-control facilities at certain food plants.

LABOR STANDARDS—Failure of Congress to agree on wage and hour legislation before adjournment in August only delays this type of federal regulation. The harshness of the standards, and the vigorousness of enforcement, will be determined by Congressmen on the basis of what they hear back home during recess. The talk about the Capitol continues to indicate a 40-hour week and a 40-cents-per-hour wage as the limits likely to be fixed by Congress on the Labor Standards Board when constituted. But consideration of more drastic limits, up to 70 cents and 35 hours, will have consideration before this bill becomes law.

TAX LAW—The national debt makes a new all-time high each month. Tax revision, therefore, becomes tax increasing. There is no evidence that the Treasury will encourage, or the President permit (if he can help it), even minor adjustments of the federal tax laws if they reduce burdens by curtailing treasury income. The President intends to balance the budget, if ever, by more taxes. And he intends to impose these on business. Hearings regarding tax revision will begin in November, regardless of when Congress reconvenes.

C. ROY MUNDEE

He succeeds Fletcher H. Rawls as chief of the Foodstuffs Division of Bureau of Foreign and Domestic Commerce, Mr. Rawls having been made assistant director of the bureau. Mr. Mundee contemplates no marked changes in the routine work of his agency.

CONCENTRATES

• Tentative approval for four marketing agreements for potatoes were announced by AAA on Sept. 5, the areas covered including Maine, Idaho, Michigan, Minnesota, Wisconsin, North Dakota, Colorado, Nebraska and Wyoming . . . The Department of Agriculture has revised standards for milled rice, established standards of quality and condition for split peas and promulgated rules and regulations governing the inspection and certification of live poultry and live domestic rabbits for class, quality and condition.

• Unprecedented numbers of tuna fish recently have come into Massachusetts Bay waters, promising a new tuna-canning industry—already Gorton-Pew Fisheries Co. is planning to install equipment for canning the fish . . . A new million-dollar fish pier is being constructed at Gloucester, Mass., and there will be storage capacity for five million pounds of frozen fish, Frick Co. reports.

• It has been discovered that addition of a small amount of Diglycol Laurate serves to break the foam on a vat of skimmed milk or whey, according to Glyco Products Co. . . . To provide an outlet for small, inferior peaches, the fruit products division of University of California has developed a new product, crushed peaches, which resembles crushed pineapple and will be sold for use in ice cream, ices, whips, cake fillings and puddings . . . A new potato said to yield well, be resistant to disease and to cook and bake well has been developed at Michigan Experiment Station; of two seedlings giving the most promise, one has a red and the other a snow-white skin.

• National Macaroni Week will be observed Oct. 10-16 and National Milk Week, Nov. 14-20 . . . The 1938 convention of National Confectioners Association will be held at New York, June 7-10 . . . A dairy manufactures conference will be held Nov. 17-20 at the University of Illinois . . . The First Annual Coffee Festival will be held at Sudley, Md., the week of Oct. 10, under the sponsorship of Pan-American Coffee Association, the diplomatic corps of coffee-producing countries and interested dealers and roasters . . . Three grades of ice cream, certified, grade A and grade B have been established in Connecticut.

Quick-Freezing Quality in Poultry

(Continued from page 579)

ation, each carton is put inside a wooden frame and stacked on a push-truck to be taken to quick freezers. These units are of the plate type. In loading the freezers, the cartons are slipped between the plates until the unit is full. Then controlled hydraulic pressure is applied to move the plates together and make firm contact between the plates, the sides of the package and product to provide efficient heat transfer.

Freezing completed, the poultry is packed 36 in a box, in double-corrugated paperboard boxes, these containers being fairly efficient heat insulators. Then the boxes are sealed and stacked on push-trucks which carry them to a cold-storage room where the temperature is kept below freezing and the product is held until shipped East by refrigerated truck.

As has been seen, extreme care is taken in the plant operations to assure that a quality product goes into the freezers. But to make doubly certain that the poultry meets its standards, Birds Eye has field laboratory men make periodic scientific analyses of the product after it has been completely prepared and is ready for packaging and freezing. This leaves no doubt as to whether the quality of the birds is up to par.

Nor does Birds Eye relax its quality supervision until the poultry reaches the consumer. It is the policy to license only reliable dealers and those equipped with the refrigeration facilities for keeping the quick-frozen foods in sound condition.

Birds Eye foods have been growing in demand by leaps and bounds during the past few years until the company problem is now one of production to meet the demand rather than one of sales promotion to create a demand. Three years ago only three or four hundred stores were selling Birds Eye foods. Now there are 2,400 outlets, this to be increased to 3,000 in the next several months. One of the important reasons for this growth in favor among consumers is the policy of the company to control quality and to produce a standardized quality on which the consumer can depend. Among the dozens of items handled by Birds Eye, poultry is one of the fastest selling, a tribute to real quality control on a product which long has been a gamble to the consumer in search of the makings of a good chicken dinner.

First Food-technology Conference Is Big Success

THE FIRST CONFERENCE on food technology ever to be held in the United States occurred at Massachusetts Institute of Technology, Cambridge, Mass., under the leadership of Dean S. C. Prescott and Prof. B. E. Proctor, Sept. 14-17. Attendance numbered more than 550 men and women from all parts of the United States, with the West Coast well represented. Those who came represented nearly all branches of food manufacture, and there were a large number of technical specialists from equipment and supply companies, as well as research scientists and food-control officials from government, state and municipal laboratories.

In connection with the conference was a meeting of the New England Section of the American Society of Refrigerating Engineers — a session which brought together some of the outstanding refrigeration specialists of the world, including Dr. R. Plank, Director of the Kältetechnisches Institut Technische Hochschule, Karlsruhe, Germany; Dr. M. Piettre, Director of Institut International du Froid, Paris; Drs. T. Moran and J. Pace, of the Low Temperature Research Station, Cambridge, England; Louis Berube, Technologist of Maritime Fisheries, Quebec, Canada; Harden F. Taylor, Atlantic Coast Fisheries Co., and Gardner Poole of Frosted Foods, Inc.

Four objectives of the conference were: 1. To bring together those who were interested in scientific advancement of the food industries, whether they were teachers, investigators or manufacturers; 2. To emphasize the essential unity of the character of the problems of the industry; 3. To present examples of advancement in technology along specific lines; and 4. To emphasize the need and importance of continuous research.

Unsolved Problems Considered

Considerable emphasis was placed on describing the important unsolved problems of several branches of the industry and on the engineering as well as technical side of food processing. Wilbur C. Tideman, of the New York State Department of Health, in speaking about "Pasteurization Engineering for Dairy Products," pointed out that several of the earlier methods of pasteurization which are now out of existence met their demise because of very poor engineering design. If better engineering had been employed, the older equipment would have met health-department requirements and might still be in existence. The methods were not so much at fault as the engineering by which the methods were applied. He criticized equipment users for not studying their own needs and specifying what they should have in the way of design, instead of waiting for equipment-supply companies to come around with something new.

How the unit operation is to become the basis of the new profession of food engineering was discussed by L. V. Burton, Editor of FOOD INDUSTRIES.

F. C. Blanck, Division of Food Research, Bureau of Chemistry and Soils, spoke of the need for a greater understanding of the management of research. He pointed out that technical progress in food manufacture created new markets for farmer-producers of raw materials, that manufacturers achieved new and more precise methods of quality control and that consumers were greatly benefited by the increased availability of foods when they were of their highest nutritive quality. This point was also touched by Lewis W. Waters, vice-president of General Foods Corp., who felt that if adequate food supplies were available to certain foreign nations there would be less of a menace to peace.

Gas Keeps Meat Longer

If chilled beef is stored in air containing 10 per cent of carbon dioxide, it will remain free of mold and slime for at least 60 to 70 days, it was pointed out by Dr. Thomas Moran, of the Low Temperature Research Station, Cambridge University. Gas storage has made it possible for Australia and New Zealand to export chilled beef to Great Britain, and this trade is expanding. For bacon, the best practice is to store it in carbon dioxide without any oxygen present. It has been kept in such a atmosphere at 10 deg. C. for 12 months, in good condition. Eggs in the shell will remain free of mold and will not suffer from evaporation for at least nine months, when stored at 32 deg. F. in 60 to 100 per cent carbon dioxide and at a saturated humidity, Dr. Moran said. However, the quality of the yolk and white together is best preserved by storage in air containing about two and one half per cent of carbon dioxide.

The advantages of using ozone in the storage of meats and eggs were covered by Professor Arthur W. Ewell, Worcester Polytechnic Institute. Two illustrations were cited by Dr. Ewell: With the help of ozone, eggs carried for eight months have been indistinguishable by various tasting tests from those only a few days old. Meat stored at 36 deg. F. and 92 per cent relative humidity for seven or eight weeks accumulated no mold or slime.

Quick Freezing Vs. Vitamins

In a paper prepared by Dr. R. P. Jenkins and Dr. D. K. Tressler, of the New York State Agricultural Experiment Station, and Dr. Gerald A. Fitzgerald, chief chemist, Birds Eye Laboratories, it was pointed out that freshly frozen hand-shelled peas had the same vitamin C content as the freshly harvested product, while freshly frozen peas which had been put through the usual commercial preparation and packing procedure had lost from 25 to 30 per cent of their content of this vitamin. Blanching was found to be responsible for about one-third of the total loss, the remainder occurring during grading and washing. Quick-freezing itself did not cause any additional loss of Vitamin C, and no loss was noted during five months of storage at 0 deg. F. Thawing adequately blanched frozen peas was not found to cause any appreciable loss of the vitamin.

Old problems encountered in packing fruit juices can be solved by recent developments in packing methods, and the canning industry has revolutionary possibilities ahead of it through quick heating and cooling processes, according to a paper presented by Dr. S. Henry Ayers, director of research of the Crown Can Co. Dr. Ayers described methods used in the Sun-Dine plant, including the Stero-Vac process. In extracting citrus juice, Sun-Dine Co. grates the peel and uses a spray of water to wash off the grated peel and remove the oil. Then the fruit is crushed and the juice extracted by pressure, oxygen being removed by boiling the product under high vacuum and at a low temperature. The juice is flash-heated in the final container in the practical absence of air. This is accomplished by steam injection through a patented valve in the end of the can.

MEN, JOBS *and* COMPANIES

Industry

» MRS. BAIRD'S BAKERY, which operates large plants at Dallas and Fort Worth, is planning construction of a $100,000 plant at Houston.

» BURNHAM & MORRILL CO. has sold its clam-canning factory at Permaquid Beach, Me., to Fred O. Gilbert.

» CONTINENTAL BAKING CO. has begun construction of a $175,000 air-conditioned plant at Little Rock.

» DELUXE FOOD CORP. is building a $50,000 dairy product plant at New Iberia, La.

» DUHE-BOURGEOIS SUGAR CO. is enlarging its cane-grinding mill at Jeanerette, La., at a cost of $300,000.

» ELLIOTT & CO., Duluth, Minn., recently purchased the plant of Schallermeier & Son Packing Co., Superior, Wis.

» GENERAL FOODS CORP. has opened at Battle Creek, Mich., a factory for the manufacture of "Huskies," a maintenance building, a new power house and a new cafeteria for employees.

» GENERAL MILLS, INC., has formed with Eastman Kodak Co., Rochester, a jointly owned subsidiary known as American Research Products, Inc. The subsidiary will produce vitamin A from fish-liver oils by the process of molecular distillation.

» GRIDLEY DAIRY CO., INC., Milwaukee, recently completed remodeling of its north side plant and is now revamping its main plant.

» H. J. HEINZ CO. has completed a $100,000 addition to its pickle plant at Holland, Mich., and the company recently opened a New York office in Rockefeller Center to supplement its offices in Long Island City.

» HENRY & MISSERT CO., Buffalo, has moved into larger quarters and will increase its production to ten cars of flour per day, eventually stepping it up to fifteen cars.

» KRAFT-PHENIX CHEESE CORP. is operating a new plant at Winnsboro, Texas. The plant has a daily capacity of 120,000 lb. of milk and is equipped with six 11,000-lb. cheese-making vats.

» LUER PACKING CO., Los Angeles, is building a two-story addition to its meat plant.

FRANK A. KEMP

President of Great Western Sugar Co., Denver, he recently was made head of United States Beet Sugar Association. This organization represents sugar companies in eleven Western states, with approximately 85 per cent of the beet-sugar production of the nation.

WILLIAM H. MARCUSSEN

He succeeds Harry A. Cronk as president of Borden's Farm Products Division, New York, Mr. Cronk becoming chairman of the directing board, a newly created position. Mr. Marcussen has been with Borden almost 25 years, serving as assistant production manager, production manager, vice-president of the farm-products division and chairman of the metropolitan division.

» MAUSER MILLING CO. suffered a loss of $300,000 when its plant at Laury's, Pa., recently was destroyed by fire.

» MAX AMS, INC., New York has taken over the honey business of Hecker Products Corp.

» MILWAUKEE WESTERN MALT CO. is erecting a $175,000 barley and malt elevator.

» PORTLAND (ME.) FISH CO. will install a modern blow-type fast-freeze refrigeration system and a 1,000,000-lb.-capacity storage system in the plant which it is now rebuilding.

» SAMBO DAIRY PRODUCTS, INC., Brooklyn, N. Y., has purchased the preserve, jelly, peanut butter and mustard plant of Hecker Products Co. and has acquired the "Acme" tradename. The dairy-products company also has constructed a honey plant.

» SWIFT & CO. has opened a new packing plant at Ocala, Fla., and is remodeling at a cost of $45,000 a four-story building which it purchased in Cleveland.

» SWIFT CANADIAN PACKING CO. will put up at St. Boniface, Man., a new $2,000,000 packing plant which is scheduled to go into operation late next year.

» WILLIAMSON CANDY CO., has closed its Brooklyn, N. Y., plant and dismantled the equipment. All manufacturing operations will be carried out at Chicago. The Eastern plant was too small to handle the expanding business in its territory.

Personnel

» WALTER W. BARR has succeeded the late C. C. Brotherton as vice-president and general manager of H. H. Clausen's & Sons, Inc., Charleston, S. C.

» R. M. BOHN, who went with General Foods Corp. recently, is not in the Calumet Baking Powder division, as stated in this column in August, but is doing research work on biscuits and crackers, being located at Chicago.

» RAY R. CANTERBURY, Seattle, has been elected president and manager of Quilcene Oyster Co.

» H. D. DIDIER is supervising production and sales at Buckeye Canning Co., formed recently at Weston, Ohio, to can tomatoes.

» ROBERT EAKINS has been appointed general manager of Producers Milk Co., Ironton, Ohio.

» DR. ARTHUR C. FAY has been made director of laboratories by H. P. Hood & Sons Co., Boston. Dr. Fay was pro-

fessor of bacteriology at Kansas State College and Dairy Bacteriologist at Kansas Experiment Station.

» DR. FREDERICK FENGER, who is in the Armour & Co. laboratories at Chicago, has been appointed chairman of the committee on digestive ferments and glandular products of American Drug Manufacturers Association.

» GREGORY H. FREDERICK has resigned as director and chairman of the board of Atlas Malting Co., Bay City, Mich.

» CLAUDE R. FREED has been named manager of the newly formed Selected Dairies, Winston-Salem, N. C. He had been head of the plant of Biltmore Dairy Farms, Asheville, N. C., for ten years.

» DR. CLAUDE H. HILLS has been added to the experimental bakery staff of the Borden Co. research laboratories at Syracuse, N. Y.

» BRANT HOLME, for the past six years manager of the Hutchinson (Kans.) plant of Morton Salt Co., has resigned to become affiliated with new interests.

» CLARENCE P. JONES has been made general manager of Banner-Grocers Baking Co., Cincinnati. He had been with Purity Bakeries Corp. for ten years.

» OSCAR KRAUSE has been elected president of Banner Brewery, Saginaw, Mich.

» B. L. LAMB, formerly district manager at McKeesport, Pa., for Cudahy Packing Co., has been transferred to the Memphis district to become sales manager.

» GEORGE I. LANGHOFF, who has been active in the sugar and molasses business for twenty years, has gone with Southern Sales Co., a New Orleans brokerage house.

» PARLIN LILLARD, former vice-president of Snow King Baking Powder Co., which recently was acquired by General Foods Corp., New York, has joined the latter company to be in charge of Snow King and Dairy Maid operations.

» R. S. SCHIERS has been placed in charge of the Columbus, Ohio, district of Union Salt Co.

» LEONARD SIMMS became western traffic manager for General Foods Corp. on Sept. 1. His headquarters are at Battle Creek, Mich.

» GEORGE P. URBAN, JR., son of the president of the George Urban Milling Co., Buffalo, has joined the cereal chemistry department of that company.

» JOHN S. WILKINSON, Oconomowoc, Wis., for the past eleven years general sales manager of Carnation Co., has been elected to the board of directors.

» HANS WINTER, assistant brewmaster of G. Krueger Brewing Co., Newark, N. J., has gone to Milwaukee-Western Malt Co. as superintendent.

» E. R. WYLIE, formerly of New York, has started a coffee-blending business in Belmont, N. H.

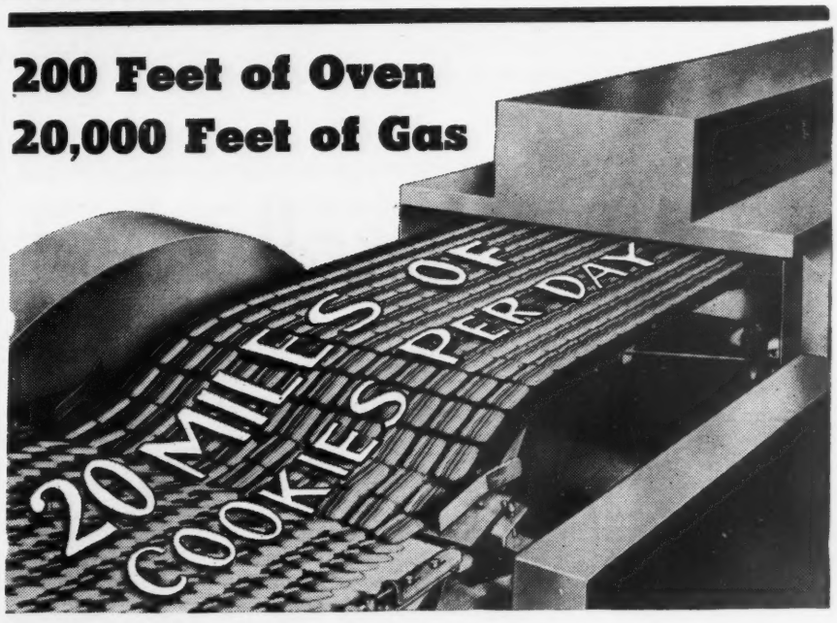
Deaths

» JOHN C. AINSLEY, 75, pioneer in the California canning industry, Aug. 22, at Campbell, Calif.

» PAUL F. BEICH, 73, chairman of the board of Paul F. Beich Co., Bloomington, Ill., Sept. 9. He was long a leader in the confectionery field.

» GEORGE H. BENNETT, 70, treasurer of National Cottonseed Products Association, at Memphis, recently.

200 Feet of Oven
20,000 Feet of Gas



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SOMETHING NEW in the baking world . . . something that is pushing production records and fuel records out the window . . . the new Greer Automatic Band Oven, heated by Kemp Ribbon-Flame Burners, fired by the famous Kemp Industrial Carburetor.

Figure on a ton of production per hour, of any kind of cookies or crackers you want to make. Figure on 2,000 cu. ft. of gas per hour. Figure on absolute temperature control and constantly uniform cross-oven heat distribution.

And if you have any more room on your cuff, figure on writing Kemp for details. Note the address, **The C. M. Kemp Manufacturing Company, 405 East Oliver St., Baltimore, Md.**

KEMP of BALTIMORE

» WILLIAM E. CANDY, 64, former president of the Busy Bee Candy Co., St. Louis, Aug. 22.

» ISAAC A. CLAYTON, SR., 70, treasurer of Royal Crystal Salt Co., and a pioneer in the salt industry, at Salt Lake City, recently.

» FRANKLIN M. CROSBY, JR., 35, employee of General Mills, Inc., Minneapolis, and a son of Franklin M. Crosby, vice-president of the company, Sept. 8.

» JUDSON C. DRAKE, 59, former superintendent of bakeries for National Biscuit Co. and more recently associated with Drake Bakeries, Irvington, N. J., Aug. 21.

» JOHN GAINER, 80, founder and president of Gainers', Ltd., pioneer Western Canada packing firm, at Edmonton, Alta., Aug. 21.

» MYRICK D. HARDING, 62, assistant general plant manager of Armour & Co., Chicago, Aug. 17.

» WILLIAM R. ROACH, 75, owner and operator of W. R. Roach & Co., Grand Rapids, Mich., Sept. 6. A "grand old man" of the canning industry, Mr. Roach formerly was president of National Canners Association, Canning Machinery & Supplies Association, the Old Guard Society and the former Western Canners Association.

» HENRY SCHMADEL, 63, president of Schmadel Packing & Ice Co., Evansville, Ind., Aug. 21.

» JOSEPH T. SMITH, 72, president of Smith Bros. Brewery, New Bedford, Mass., Sept. 3.

» CHARLES T. WARD, 64, chairman of the board of Francis H. Leggett & Co., at New York, Sept. 7. He had been with Leggett since 1890.

» CHARLES P. WHITEMAN, president of California Preserving Co. and former head of National Food Brokers Association, at Los Angeles, Sept. 7.

Associated Industries

» CATERPILLAR TRACTOR CO. is spending half a million dollars to enlarge its plant at Peoria, Ill.

» CHICAGO PNEUMATIC TOOL CO. has opened a district factory sales and service branch at Salt Lake City.

» DIAMOND ALKALI CO., Pittsburgh, has appointed G. S. Cooper vice-president in charge of sales.

» E. I. DU PONT DE NEMOURS & CO., INC., will construct at Clinton, Iowa, a plant for the manufacture of "Cellophane" cellulose film.

» LINCOLN ELECTRIC CO. has opened a new sales engineering office at Bluefield, W. Va.

» MATHEWS CONVEYOR CO. has opened a sales engineering office in Detroit.

» MONSANTO CHEMICAL CO. has elected R. J. Hawn vice-president.

» PANGBORN CORP., Hagerstown, Md., has taken over the dust-collecting interests of Blaw-Knox Co.

» STEEL & TUBES, INC., subsidiary of Republic Steel Corp., has opened a branch office in Baltimore.

» WORTHINGTON PUMP & MACHINERY CORP. has appointed W. A. Neill as manager of engineering and sales at its recently reopened plant at Holyoke, Mass.

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min G that was originally present in the skim milk. It has been limed to 0.1 per cent acidity (as lactic acid) at the end of the 42-hour fermentation period. Then it has been heated to 205 deg. F. by live steam blown into the perforated pipe at the bottom of the tank. After ten minutes of standing, the albumin coagulates in large flocs or chunks that settle rather quickly to the bottom. The clear liquid above is decanted by opening the valve in the 4-in. swing pipe that reaches nearly to the surface from the bottom of the tank. As the liquid level falls, the free end of the pipe is lowered deeper and deeper into the tank. In this way it keeps leading off only clear liquid. The liquid runs into the suction side of the centrifugal pump and is forced through a plate and frame filter press. By decanting the liquid in this manner, the solids are kept out of the filter as much as possible, for otherwise they would soon clog it and impede the flow. The albumin is ultimately dried and used as animal feed.

The filtered liquid is clearer than it was before, but it is still far from being a solution of pure calcium lactate. It needs much more treatment. From the filter press, the filtrate is pumped by a small centrifugal pump to a clean empty wooden tank, like the fermentation tank, where enough more lime slurry is added to change the reaction of the liquid from 0.1 per cent acid to 0.1 per cent alkali. (One c.c. of 0.1 Normal acid solution would just neutralize 1 c.c. of the alkaline solution). Then a filter aid, diatomaceous earth, is added; also, a decolorizing carbon, Norit. The filter aid is for the purpose of getting out all the fine material that ordinarily passes through the filter cloth, and the decolorizing carbon is to get rid of the green color in the fermented whey. The whole tankful is thoroughly stirred with the mechanical stirrer, but no more steam is needed. After about fifteen minutes the tank is decanted as before, the contents being pumped by a centrifugal pump into another filter press. What sludge remains in this tank is shoveled out and sent to the refuse dump.

From the second filtration, the liquid is pumped again into another clean wooden tank where it is acidified with lactic acid to 0.05 per cent lactic acid, and then it gets a second dose of filter aid and decolorizing carbon. Next it is decanted and filtered again in the same way as before. Thus, it will be seen that the first filtration was on the alkaline side and the second filtration was on the acid side. This is an extremely important point in the process of purifying the calcium lactate and has been covered by a patent (U.S. Patent 2,071, 368. Feb. 23, 1937).

Sludge from the second filtration contains much unspent decolorizing carbon and can be used again, so it is shoveled over into the tank that is to receive the next batch for the first or alkaline filtration. This permits cutting down the amount of decolorizing agent to about half the amount that would be otherwise necessary.

Crystallizing and Washing the Calcium Lactate

Filtrate from the second filtration is called crude calcium-lactate liquor and is now ready for further purification

Thought for FOOD

F.O.B. · · · P.D.Q.

We enjoy having a customer "come to the office" to discuss the economical application of alcohol to his particular production problem . . . but it's a gross waste of time to appear personally to inquire about delivery date of, say, a tank car of alcohol. Users of ROSSVILLE alcohol know from long experience that a 5-gallon can—or a car—goes out the same day you say, "Ship it!" and from a nearby plant or warehouse.

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New York Central Building, New York, N. Y.

or refinement. It can be stored without danger of immediate spoilage when necessary, though ordinarily it is immediately pumped into a vacuum evaporator to be concentrated by boiling under a 25-in. vacuum. Crude-lactate-liquor evaporation is a very foamy operation and not only needs very skillful operation of the vacuum pan to avoid boiling over but it also requires an extra high pan with plenty of room for the foam. Otherwise it will boil over and much will be lost.

Concentration is carried to the point where it tests 15 deg. Beaume. It is now a fairly thick liquid and is pumped to portable water-cooled crystallizing vats on the balcony. (See Fig. 6.) These crystallizing tanks are mounted on casters to permit moving where needed. Also, they have stainless-steel linings and a water jacket through which cold water flows to remove the heat. After ten to twelve hours at 50 or 60 deg. F., the calcium lactate crystallizes and is ready for separation of the solids from the liquid by use of a Hepworth basket-type centrifuge. The tank is wheeled up to a chute leading down to the centrifuge and the contents allowed to pour into it. Centrifugal force then spins, or "whizzes," the mother liquor off, this going through further treatment and purification while the crystals remain in the basket of the centrifuge. Before the machine stops running, the crystals of calcium lactate are washed by a small stream of water, and the washings are collected and evaporated to 13½ deg. Beaume and recrystallized, then centrifuged and washed again. The last wash water is again evaporated and the crystallization repeated for a third time. This time, the washings are sent to the sewer.

The three sets of crystals of crude calcium lactate are combined, put into another tank (glass-lined this time) and dissolved in a little water at 150 deg. F. preparatory to further purification. Here more Norit and filter aid are added, and then the liquid is filtered as was done after the fermentation was completed, i.e., the sludge from the second filtration is added back to the tank for the second treatment of the crude calcium-lactate liquor to conserve the decolorizing carbon.

After the second filtration, the liquid is called refined calcium-lactate liquor. It can be stored temporarily or it can be further treated and converted into commercial grades of calcium lactate, or it can be further purified by repeating the recrystallization operation and by further washing.

At this point it is very difficult to keep the various steps in mind by the mere use of words. Hence the flow diagram, Fig. 4, will be useful in following the operations of the process.

The refined liquor is concentrated to 11.5 deg. Beaume (not 13.5 deg. Beaume as before) to obtain slower crystallization, which results in purer crystals. These crystals, when washed, are either used for subsequent production of the best grade of lactic acid or can be dried and sold as calcium lactate. The quality of the dried crystals at this point is U.S.P. grade. Washings from the centrifuge go back to the crude liquor, so that nothing of value may be lost.

The 12-per cent loss of whey occurs during washing the casein.

Dried-whey yield represents about 6.22 per cent of the whole milk or, on the skim-milk basis, the recovery averages between 5½ and 6 per cent.

Part II will appear in November

PLANT SANITATION
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How to get better cleaning results at no greater cost

Food authorities agree that quality of product is directly influenced by the sanitary conditions surrounding processing operations. This is why so many food executives insist on the superior results, the economies modern cleaning and sterilizing methods provide.

Guarding against product contamination from bacteria, mold and other organism need not be a problem or a difficult task. Here is the reason . . . you can maintain scrupulous cleanliness easily and at low cost simply by using dependable Oakite materials. With them you can keep every square foot of floor space, walls, processing equipment, etc., spotless and sanitary.

Put Our Long Experience to Work for You

Why not let our 29 years' experience serving all types of food plants help you get better cleaning results, help maintain sanitary standards easier and more effectively? Drop us a line today . . . give us the opportunity to demonstrate this to you . . . all without obligation on your part.

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SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

New Discoveries

(*Continued from page 605*)

vitamin potency or in growth maintenance. There was apparently a slight loss of reproductive activity in the rats receiving pasteurized milk.

Although somewhat less ascorbic acid was found in pasteurized than in raw milk there is as yet no evidence that pasteurization is responsible for the loss.

Digest from "Effect of Pasteurization in Absence of Air on Nutritive Value of Milk," by Henri Simonnet, Gustave Guittonneau, Germain Mocquot and Andre Eyrard, *Comptes rendus de l'Academie des Sciences* 204, 1690, 1937. (Published in France.)

Pasteurizing Milk

AN IMPROVED PASTEURIZER FOR MILK operates by the holding process in a chamber traversed by the liquid in a continuous stream without dead spaces. As disclosed in British Patent 465,232 (granted July 29, 1937, to British Thomson-Houston Co., London), the pasteurizer comprises a vertical cylinder (which may be made of glass or other translucent or transparent material), with an inlet at the bottom and a discharge outlet at the top. Liquid flow is controlled by a series of baffle plates, spaced sufficiently from the wall to allow milk to flow from plate to plate along the inner wall of the cylinder. The design and arrangement of plates is such that the liquid flows alternately through the plate at one level and around the plate at the next level. This is accomplished by alternating perforated and unperforated plates. The perforated plates also have a central aperture, with diameter equal to twice the vertical distance between plates. This arrangement of alternate flow through and around the plates promotes thorough admixture of the milk and so helps to avoid localized overheating.

FRESH PRODUCE

Flavor in Vegetables

AMONG VEGETABLES which are distinctly unfriendly to chlorides in the soil are tomatoes, potatoes, beans, cucumbers and radishes. On the contrary, celery and spinach take kindly to soil chlorides. Field tests in which potash and nitrogen were administered as chlorides and as sulphates brought out marked differences in flavor of the vegetables, with favorable effects on celery and spinach in the chloride plots and unfavorable effects on other vegetables. Crop yields also responded favorably or unfavorably according to the chloride or sulphate fertilization of the soil. In radishes the mustard oil content, which has therapeutic value, was more than doubled in the sulphate plots as compared with the chloride plots.

On the other hand, celery was superior in essential oil content (flavor) when grown in chloride plots. Spinach was better in appearance (marketability) and flavor when grown with chloride, but was still better when potash was given as the nitrate instead of either chloride or sulphate. The merit of nitrate-grown spinach was particularly noticeable in the excellent flavor which was retained after boiling. Probably the flavor of spinach depends more on its nitrogenous components than on its sugars.

Digest from "A Study of the Action of Chloride and Sulphate Ions on the Character of Various Vegetables," by W. Schuphan, *Angewandte Chemie* 50, 646, 1937. (Published in Germany.)

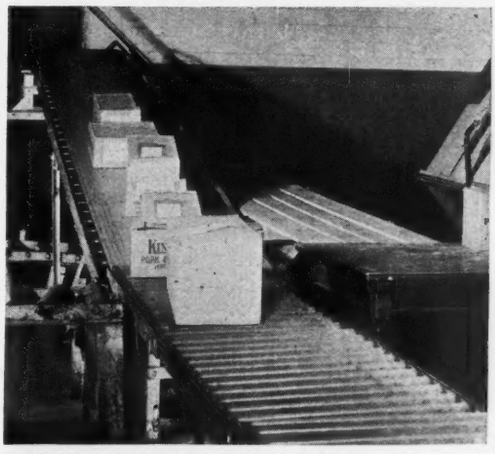
FRUITS

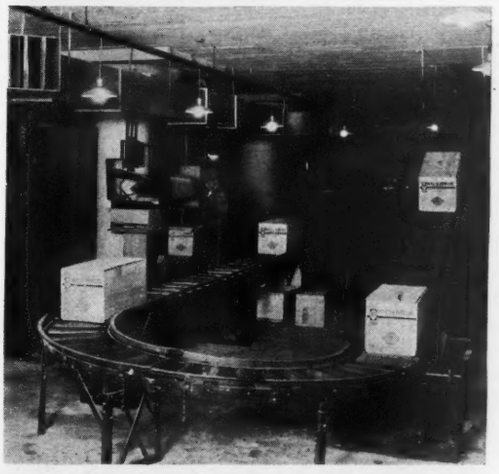
Organic Acids of Ripe Bananas

THE PRINCIPLE NON-VOLATILE ORGANIC ACID of the ripe banana is l-malic acid,

MODERN FOOD PRODUCTION DEMANDS

Continuous Flow





MATHEWS

CONTINUOUS FLOW PRINCIPLE OF HANDLING MATERIALS

CONVEYERS

FOOD consumption is the most stable and continuous human activity. Therefore, food production is the most logical field for continuous flow principles. Yet historically continuous flow was first developed in the highly seasonal canning industry in order to attain maximum output in limited time.

Continuous flow materials handling reduces obstinate costs, simplifies production, improves processing and permits most efficient use of plant facilities in every food product field. From incoming bulk raw materials through all the various processing operations to the packaging, casing and shipping, Mathews system based upon Continuous Flow Principles make production one unified, integrated whole.

With a Mathews system there are no bottlenecks, no confusion, no delays. Storage and warehousing are reduced, products reach consumers in shortest time.

Continuous flow production is most flexible and most adaptable to modern distribution requirements.

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an acid that is easily oxidized in the human body. In ripe fruit it is apparently present as the free acid. If other acids occur at all, they are present in extremely small amounts. During ripening the acid content increases to a peak and then gradually decreases as the fruit matures. It is barely off the maximum at the stage of ripeness where the fruit is usually ready to be eaten.

Digest from "Organic Acids of the Ripe Banana," by P. L. Harris and G. L. Poland. *Food Research*, 2, 135, 1937.

MEATS

Sausage Casings

SINCE GERMANY'S SUPPLY of animal intestines for making sausage casings has been largely imported, an active search has been made for substitutes obtainable from domestic sources. The artificial casings made from viscose by extrusion through an annular slit into a coagulant have shown most promise. In America, where the material for making the viscose for sausage casings is cotton linters, strict quality requirements are imposed. To obtain cellulose of satisfactory quality is not, however, so important for final quality as are the factors involved in the chemical and physical processes of manufacture.

Again, there are special requirements of the trade which must be met, a leading example being found in the hard sausages to which the artificial casings will not adhere properly. This difficulty was surmounted by lining the formed casings with a thin film of gelatin, which gives good adhesion. Again, many customers object to a transparent casing and so it has been necessary to find and use thoroughly acceptable means for making the surface opaque. In mechanical strength the artificial casings are superior to the old animal membrane type, having a wet strength of 1.5 to 2.5 kg. per sq.mm. They take ink readily, but the necessity of having any printed lettering or designs "fast" both to smoking and to boiling made it somewhat difficult to select a suitable ink.

Digest from "Making Seamless Casings From Cellulose Solutions," by R. Weingand, *Angewandte Chemie* 50, 479. 1937. (Published in Germany.)

WHY LO-BAX IS A DEPENDABLE STERILIZER

FOR sterilizing surfaces with which dairy and other food products come in contact, you require a dependable, quick-acting bactericide. Your bactericide must also, of course, be safe, convenient and low in cost.

How does Lo-Bax meet *all* these vital requirements?

In the first place, extremely low alkalinity and high chlorine "availability" make Lo-Bax unique among sterilizers for speed and dependability in killing bacteria. The quick solubility of Lo-Bax, moreover, renders positive results doubly sure. For at the end of only one minute, Lo-Bax solutions are up to full strength and ready for use. There are no undissolved, concentrated particles to cause corrosion.

Lo-Bax is easy to use—just add it to water by the spoonful as needed. Lo-Bax is low in cost—one bottle (1¾ lbs.) makes more than 1,000 gallons of clear, 100-p.p.m. bactericidal rinse solution.

Why not let Lo-Bax help you maintain low bacteria counts? Write for full information today.

Make This Test—Prove to yourself that Lo-Bax dissolves faster

Fill a milk bottle up to an inch from the top with ordinary tap water. Pick up a small amount of Lo-Bax on a knife blade and drop it slowly onto the water.

Now notice how the fine Lo-Bax powder floats for a moment on the surface and then gradually settles through the water, dissolving as it goes. Watch the particles break up and completely dissolve as they slowly descend, see them disappear even before they reach the bottom. Test the chlorine in the resulting solution and prove to yourself that Lo-Bax makes full strength solutions in less than one minute.

After you've watched Lo-Bax go into solution, make this same test with a similar product. Watch the coarser particles nose-dive for the bottom, remain there undissolved, inert. Time how long it takes you to break up these particles and stir them into solution.

Then consider what the full strength solutions quickly secured with Lo-Bax mean to you in added convenience and more positive results—what this superior solubility means in safety from corrosion!

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OILS & FATS

Tallowy and Rancid Fats

OXIDATIVE SPOILAGE OF FATS is of two types: one imparting the familiar rancid taste and odor, while the other imparts a "tallowy" taste and odor with a metallic tang in the taste. By a new method for estimating peroxide oxygen, in fats and other substances, it has now been proved that both types of spoilage involve the formation of peroxides as a stage in the oxidation.

Tallowy spoilage follows irradiation with ultraviolet light, or exposure to direct sunlight. Rancidity results from exposure to air at elevated temperatures. It has also been found that whale oil (even after hardening by hydrogenation) has the peculiarity of particular copious peroxide formation when it is oxidized. This is a useful observation because it greatly facilitates detecting the adulteration of fats (such as lard) with raw or hardened whale oil. It is only necessary to expose the sample to ultraviolet light for a short time and then make the photometric peroxide determination, which quickly reveals the presence of any considerable proportion of whale oil.

The step photometer is used in the new method for estimating peroxides. Procedure is simple and rapid, so that it is an important advance in the examination and testing of fats and other substances in which peroxides are formed

by oxidation. Thus the effects of heat, sunlight and other factors influencing atmospheric oxidation can be readily followed in vegetable and animal fats and oils. It is easier to prevent spoilage when its causes can be easily and conveniently traced in this way.

Digest from "Determining Active Oxygen, and Uses of the Method in the Examination of Fats," by R. Strohecker, R. Vaubel and A. Tenner, *Fette und Seifen* 44, 246, 1937. (Published in Germany.)

Rice Oil

RICE BRAN is a very cheap byproduct in Japan and China, and from it an oil can be produced which has hitherto not received much attention because it is dark colored and difficult to refine. But recent experiments show that the crude oil can be semi-hardened, or hardened by the customary methods of catalytic hydrogenation of oils, to yield commercially useful stearins or oleins. These products can be refined by vacuum distillation to a snow white, odorless distillate. Distillation with superheated steam also yields a white product, but its odor is disagreeable (a defect which can probably be eliminated in industrial practice).

The crude rice oil has a high content of free fatty acids. This is a disadvantage in refining and in many uses of such an oil, but it can also be turned to good account. By acid esterification of the crude, highly acid oil with ethyl alcohol and 1 per cent of sulphuric acid a mixture of the ethyl esters of the free fatty acids is obtained. The product, refined by vacuum distillation, is a mobile yellow oil suitable for use as a hair oil. Thus rice bran need not be a waste material but can be chemically utilized for at least three commercial products (stearin, olein and hair oil).

Digest from "Investigations of Rice Oil and its Utilization," by Sei-ichi Ueno, *Journal of the Society of Chemical Industry* (Japan) 40, 200B, 1937. (Published in Japan.)

SUGAR

Beet Sugar and Nematodes

NEMATODES cause serious damage to sugar beets, injuring the plants and burdening the sugar refiner with a loss in yield of sugar from the infested beets. A careful study of the manner in which nematodes exert this injurious effect brought to light the fact that a poorly nourished soil favors the nematode attack and so makes the damage greater than in a richer soil. Phosphorus starvation in the soil is especially deleterious because it seems to favor the nematode attack more than does a shortage of other elements. Nevertheless, nitrogen and potassium must be supplied in ample quantity. Practical investigations have not yet revealed any direct method for destroying nematodes, so the only way to protect the beet sugar is to make sure the beets are liberally fed with phosphorus, nitrogen and potassium.

Experiments indicate that the nematodes do the harm by robbing the beet plant of its needed elements. The idea of feeding the plants more liberally to prevent attack seems wrong to some, who think this expedient encourages the nematodes rather than otherwise. But actual trials have demonstrated that loss in sugar yield is minimized by this means, so the sugar refiners are not interested in whether the actual number of nematode infestations shows an increase or decrease. It is the severity of the attack, the damage to sugar yields, that counts.

Digest from "Influence of Nematodes on Nutritional State of Sugar Beets," by Lüdecke, *Chemiker-Zeitung*, 61, 601, 1937 (Published in Germany.)

Fermentable Sugar From Wood

ACCORDING TO GERMAN PATENT 643,050 (granted March 23, 1937 to Hein-

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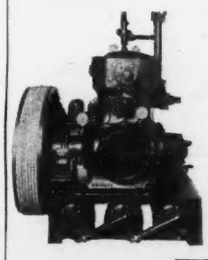

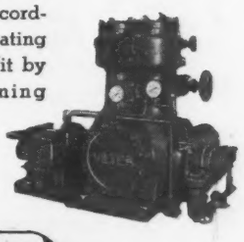

VILTER

Manufacturing Company
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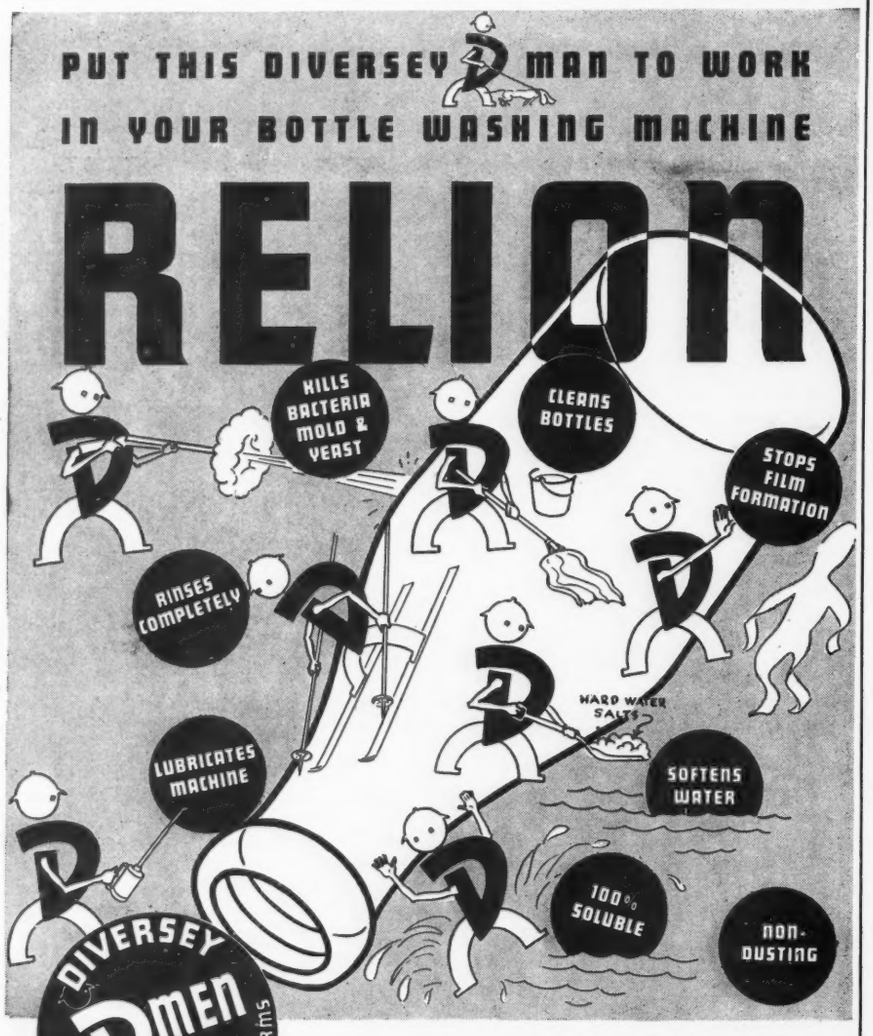
rich Scholler, Solln, Munich, Germany) the acid hydrolysis of wood under pressure to make soluble sugars is much facilitated by adding other cellulosic materials to the wood. Thus, if the wood texture is modified by admixture with straw or rice hulls, a looser structure is obtained and hydrolysis proceeds readily. Deciduous or coniferous woods may be used. As compared with hydrolysis of the wood by itself, the new method is economical in that it consumes less acid and other reagents.

As an example of the ways in which the saccharified wood can be used in fermentation processes, a sugar mash prepared from equal parts of coniferous and deciduous woods is made up to about 5 per cent reducing sugars and suitable nutrients are added. This mash, after stirring with air and adding lime (first calcium carbonate, then slaked lime) till the pH reaches 5.6, is then inoculated with a strain of yeast which is already accustomed to the wood sugar mashes. With such a mash, fermentation ordinarily takes about one day, but it can be accelerated by stirring.



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MISCELLANEOUS

Stream-pollution Measurement

THOSE WHO ARE ACCUSED OF POLLUTING STREAMS will find in this bulletin a summary of information which will be a valuable aid in understanding the nature of the alleged offense. The work has been prepared from the viewpoint of fish preservation. It contains a compilation of available information on the amount of pollution by a large number of industrial wastes which will be toxic to certain fish life. Though most of these substances are not the waste products of food-manufacturing establishments, a knowledge of the possibilities of these hazards to aquatic life may sometime be helpful in defense against accusations that may be only half truths. Data bearing on nine different substances associated with food manufacture are presented.

"Detection and Measurement of Stream Pollution", by M. M. Ellis, Bulletin No. 22. Bureau of Fisheries, U. S. Dept. of Commerce.

Foods and Gas Warfare

THE EVER-PRESENT THREAT of poison gas attacks in event of war has led European scientists to give thought to the preservation of food supplies which may be exposed to the gases. The first and simplest case is that of potable waters; reservoirs may absorb gases from the air or may be polluted by the enemy. With chloropicrin and some of the other irritants, the damage would be irreparable and there is no practical method for large scale renovation. With mustard gas, boiling, filtering through active charcoal and a period of standing would be necessary. Milk, on the other hand, would be poisoned beyond recovery by mustard gas, as proved by tests with cats.

The most difficult problem of all is the protection and preservation of meat supplies, especially in army supply trains or depots. It is by no means certain that animals which have been gassed can be safely slaughtered and used for meat. Fresh meat exposed to combat gases is probably safe if a layer a little more than ½ in. deep is sliced off and discarded, but a test should be made because the penetration may be deeper. The only safe course is to keep meat supplies in glass or tin, or thoroughly wrapped in several layers of oiled paper or of cellophane. If meat has been exposed there is a possibility that smoking or pickling would render it safe, but this possibility has not yet been confirmed by test. Feed may also be dangerous if exposed to combat gases and then fed to cattle before slaughter.

Digest from "Food Supplies and Gas Warfare," by Franz Zaribnicky, *Oesterreichische Chemiker-Zeitung* 40, 313, 1937. (Published in Austria.)

BOOKS RECEIVED

CAMPBELL'S BOOK—CANNING, PRESERVING, PICKLING, Revised Edition. By Clyde H. Campbell, Consulting and Analytical Chemist. Published by Vance Publishing Corp., 67 W. 44th St., New York, N. Y., 1937. 848 pp.; 6½x9 in.; cloth. Price, $10.

This treatise of the canning industry has been revised in format and text in a very gratifying manner. Much has been added to make it a great improvement over the first edition, and certain errors of statement have been eliminated from the text. However, there still remain a few items that should not have been included. Specifically, it is the opinion of this reviewer that the inclusion of formulas which will produce products not legal in interstate commerce, as well as in those states which automatically follow the Federal Food and Drug Law, is not a real service. Eight of 22 formulas for mustard or related products call for the use of bran or tailings. Even though the author tells elsewhere that this will require a label declaration, the "illegal" formulas are apt to mislead the unwary or inexperienced. Otherwise, the new edition is a good treatment of canning, pickling, vinegar making and the manufacture of jams, jellies, preserves, condiments and sauces. The book covers the selection of raw materials, methods of preparing and processing them, formulas for the various products, and the equipment used in the plant.

SOCIAL SECURITY IN AMERICA. Published by the Social Security Board, Washington, D.C. 592 pages; paper. Price, 75 cents; available at Government Printing Office.

This is the factual background of the Social Security Act. Part I includes a summary of foreign experience with various types of employment insurance, and data regarding the United States, including estimates of unemployment, an actuarial study of costs and a discussion of various phases of standards for classification, compensation and administrative procedure. Part II relates to old-age security problems, Part III to child problems, Part IV to provisions for the blind and Part V to Public Health Service projects. Large masses of pertinent information make the volume a valuable reference work for all concerned with personnel questions.

FROZEN-PACK FRUIT MARKETS. By Harry Carlton. Published by the University of Tennessee Agricultural Experiment Station, Knoxville, Tenn. 72 pp.; 6x9 in.; paper. This market survey of the frozen-pack industry covers, roughly, the section east of the Mississippi and north of Tennessee and North Carolina, where practically all frozen-pack products are processed and consumed.

REVISION OF TARIFF HANDBOOK ON CANNED FOODS IN EUROPE. Published by Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D.C. 1937. 41 pp., mimeographed; 8x10⅜ in.; paper. Price, 10 cents.

DISCOLORATION AND CORROSION IN CANNED CREAM. By C. J. Jackson, G. R. Howat and T. P. Hoar. Published by International Tin Research and Development Council, 149 Broadway, New York, N. Y., 1937. 10 pp.; 9¾x6⅛; paper. Free. A scientific study reprinted from *The Journal of Dairy Research*.

MARKET CLASSES AND GRADES OF DRESSED VEAL AND CALF CARCASSES. By W. C. Davis and C. M. Harris, Bureau of Agricultural Economics. Published by Department of Agriculture as Circular No. 103, 1939. 32 pp.; 5⅞x9¼ in.; paper. Price, 25 cents; sold by Superintendent of Documents, Washington, D. C.

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Sanitary—modern to the last detail—production moves like clock-work in this biscuit plant. Because Lamson Conveyors move the materials . . . bring empty cartons to the packers . . . take the filled cartons away.

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Name.....

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PATENTS

Cocoa Beans and Peanuts Roasted in Recirculated Gases Which Have Passed Through a Heating Chamber for Removal of Smoke Particles—Leslie H. Backer, Summit, N. J., Joseph H. Keenan, Brookline, Mass., and Joseph L. Kopf, East Orange, N. J., to Jabez Burns & Sons, Inc., New York, N. Y. No. 2,081,349. May 25, 1937.

Ham Given Uniform Cure by Pumping Curing Pickle Into Empty Blood Circulating System and by Immersing in Pickle Bath—Levi Scott Paddock, to Industrial Patent Corp., Chicago, Ill. No. 2,084,864. June 22, 1937.

Partially Dried Fruit Given Powdered Sugar Coating to Absorb Residual Surface Moisture—Karl Hessel, Berlin-Lichtenrade, Germany. No. 2,084,956. June 22, 1937.

Green Corn on the Cob Fully Frozen for Shelling and Preserving in a Closed Container—Robert B. Taylor, Knoxville, Tenn. No. 2,085,051. June 29, 1937.

Animal Fat Cut Into Strips of Uniform Width and Thickness with Rearrangement of Fibers to Aid Cohesion for Wrapping Around Lean Meat Cuts Prior to Cooking—Felix H. Lousot, Charles J. Muller, Hasbrouck Heights, N. J. No. 2,085,108. June 29, 1937.

Butter Substitute Containing Over 65 Per Cent Butter Fat Made by Adding a Small Quantity of an Alkaline Metal Salt of Citric Acid to Cream, Centrifuging, and Cooling to Give a Plastic Product—Herman D. Wendt, Westchester, Pa., deceased, to Milk Processes Inc., Philadelphia, Pa. No. 2,085,134. June 29, 1937.

Butter in Sheets Made into Rolls by Mechanical Means—Glen H. Holloway, Kansas City, Mo. No. 2,085,157. June 29, 1937.

Several Finely Divided Solid Ingredient Materials Added by Mechanical Means to Mix in Desired Proportions—Edward J. Lauterbur to Peerless Bread Machinery Corp., Sidney, Ohio. No. 2,085,263. June 29, 1937.

Sucker Type Confection Frozen Onto Socket for Hollow Rubber Handle—Louis Price to Joe Lowe Corp., New York, N. Y. No. 2,085,330. June 29, 1937.

Wheat Germs Stabilized Against Rancidity for Use in Bakery Products by Addition of Sodium Chloride, Grinding to Flour Fineness, Adding Inert Non-fatty Filler, and Drying—Peter John Donk and Alexander Ross MacDonald to Cerobrex Limited, Toronto, Ont., Canada. No. 2,085,421. June 29, 1937.

Tea Freed From Theine by Use of Volatile Solvent Without Application of Steam or Heat—Karl-Heinz Baruth, Berlin-Charlottenburg, Germany. No. 2,085,489. June 29, 1937.

Chewing Gum Base Made With Non-Bitter Polyvinyl Ester as Ingredient—Kenneth G. Blaikie, Shawiningan Falls, Quebec, Canada, to Shawiningan Chemicals, Ltd., Montreal, Canada. No. 2,085,490. June 29, 1937.

Ice Cream Block Confection With Central Cavity Filled With Sundae-Making Materials and Closed with a Wafer Covering Coated with Chocolate and Finally With Outer Coating of Hard Candy—George Glen Fulkerson, Huntington Park, Calif. No. 2,085,495. June 29, 1937.

Fresh Baker's Yeast Protected Against Rapid Mold and Bacterial Deterioration by Addition of Saturated Aliphatic Alcohol to Mass—Henry Brougham Hutchinson, Epsom, England, to Standard Brands, Inc., New York, N. Y. No. 2,085,857. July 6 ,1937.

Fish Tenderloins Cut by Mechanical Means—Alton L. Dunn to Benicia Fisheries, Benicia, Calif. No. 2,086,070. July 6, 1937.

High Protein Bread Made in Standard Commercial Shaped Loaves Having Porosity, Texture and Palatability of Normal Bread—Louis W. Haas to W. E. Long Co., Chicago, Ill. No. 2,086,184. July 6, 1937.

Grain Treating Machine for Making Puffed Cereals—John Heue and Arthur W. Werner to John Heue, Milwaukee, Wis. No. 2,086,266. July 6, 1937.

Biscuits Fed Mechanically From an Intermittently Operating Cutting Machine to a Continuously Traveling Oven Conveyor—George Ralph Baker and Herman Kirman, Peterborough, England, to Baker Perkins Company, Inc., Saginaw, Mich. No. 2,086,347. July 6, 1937.

Milled Curd for Cheese Making Mechanically Forked in Progressive Spiral Winding Movement From One End of Vat to Other—Edward C. Damrow, Fond du Lac, Wis. No. 2,086,353. July 6, 1937.

Beans Freed From Dirt and Rock in a Cylindrical Roll of Units Journalled into the Frame at an Angle—Charles Harman Eckhart Jr., Salinas, Calif. No. 2,086,408. July 6, 1937.

Artichoke Diffusion Liquor Concentrated to 50 to 80 Per Cent Total Solids at pH 3.5 to 7.5 for Storage Without Decomposition—Leo M. Christensen and Ralph M. Hixson, Ames, Iowa, to Chemical Foundation, Inc. No. 2,086,536. July 13, 1937.

Fruits, Vegetables, Oysters Converted to Liquid, Puree, Soup, or Conserve State by Disintegration out of the Contact with Air and Under Controlled Temperature Conditions in a Continuous Manner—Gaston S. P. deBethune, New York, N. Y. No. 2,086,539. July 13, 1937.

Potatoes Sliced for Potato Chip Manufacture to be of Uniformed Thickness Across the Slice—Joseph D. Ferry, Harrisburg, Pa. No. 2,086,708. July 13, 1937.

Biscuits Baked in a Portable Electrically-Heated Tubular-Shaped Oven—John E. Smith to Knapp-Monarch Company, Belleville, Ill. No. 2,086,827. July 13, 1937.

Wines Given Quick Aging by Subjection to Compressional Waves Having Frequency of 2,000,000 Cycles Per Second—Jakob August Bachmann, Alameda, and Roy Wilkins, Hamburg, Calif. No. 2,086,891. July 13, 1937.

Whole Citrus Fruit Rapidly Shredded for Recovery of Juices and Oils With Natural Vitamin and Volatile Contents—Wallace Curtis Hill, Pomona, Calif. No. 2,086,911. July 13, 1937.

Yeast Given Increased Reproductive and Gas-Forming Powers Through Addition of Standardized Ovarial Hormone to Wort During Yeast Growth—Ernst Kottlors, Mannheim, Germany. No. 2,087,059. July 13, 1937.

Fresh Fruit Juices Preserved Against Deterioration Without Boiling or Freezing by the Addition of an Equal Part Mixture of Mono- and Di-Saccharid Sugars and Concentration to Soluble Solid Concentration of 75 Per Cent of Weight of Syrup—Daniel V. Wadsworth and Leonard Wickenden, Manhasset, N. Y. Nos. 2,087,076 and 2,087,077. July 13, 1937.

Candy Mass Rolled and Cooled Upon Tubular Shaped Belt Constructed to Give it Increased Durability and to Run True and With Uniformed Speed Throughout Its Length—Earl F. Mayer, Evanston, Ill. to Burrell Belting Company, Chicago, Ill. No. 2,087,212. July 13, 1937.

Flour Bleached and Aged by Treatment With Chlorine-Containing Gas and a Finely-Divided Solid Ammonium Compound—Frederick H. Penn, Dallas, Tex. No. 2,087,544. July 20, 1937.

Flour Bleached and Aged Through Treatment With a Dry Free-Flowing Calcium Hypochlorite and a Dry Free-Flowing Finely-Powdered Ammonium Compound—Frederick H. Penn, Dallas, Tex. No. 2,087,545. July 20, 1937.

Flour Bleached and Aged by Mixing with a Dry Free-Flowing Finely-Powdered High Chlorine-Containing Calcium Hypochlorite and a Nitroso-Yielding Compound—Frederick H. Penn, Dallas, Tex. No. 2,087,546. July 20, 1937.

Flour Bleached and Aged by Mixing with a Finely-Powdered Calcium Hypochlorite and a Dry Free-Flowing Organic Peroxide—Frederick H. Penn, Dallas, Tex. No. 2,087,547. July 20, 1937.

High Butter Fat Cream Converted to Plastic by Cooling on a Revolving Curved Surface—Herman D. Wendt, West Chester, Pa. to Milk Processes, Inc., Philadelphia, Pa. No. 2,087,587. July 20, 1937.

Coffee Roasted in a Sealed Oven Through Which is Recirculated Under Pressure the Purified Vapors Driven From the Coffee Bean in the Course of Roasting—John T. McCrosson, New York, N. Y. No. 2,087,602. July 20, 1937.

Pimentos Roasted During Downward Passage Through Long Inclined Open-End Oven Counter-Current to Flow of Heated Air From Base of Oven—Mont M. Linkenauger, Sumter, S. C. No. 2,087,692. July 20, 1937.

Multi-Flavored Frozen Confections of Sucker Type Made by Freezing Confection in Concentric Layers—Richard J. Cowling to Joe Lowe Corp., New York, N. Y. No. 2,087,729. July 20, 1937.

Eggs Cleaned Mechanically During Passage Along Annular Grooved Roller Rotating Horizontally Through a Cleaning Liquid Bath—Ole Hansen, Menan, Idaho. No. 2,087,844. July 20, 1937.

Chewing Gum Base Made From Tasteless and Colorless Hydrogenated Coumarone-Indene Resin—William H. Carmody to the Neville Company, Pittsburgh, Pa. No. 2,087,900. July 27, 1937.

Crustless Bread Baked in Closed Container With Absorption of Portion of Vapors and Gases Given Off During Baking—Albert Horlebeck and Clemens Wisemann, Wuppertal-Barmon, Germany. No. 2,087,912. July 27, 1937.

Evaporated Milk Processed to a Given Viscosity by Sealing in Cans and Heating to Above 255 Deg. F. Followed by Flash Sterilization With Violent Agitation—Charles O. Ball, River Forest, Ill., to American Can Company, New York, N. Y. No. 2,087,962. July 27, 1937.

Whipping Qualities of Egg-Whites Improved Through Adjustment of pH Value to 5.8, Agitation in Vacuum at Temperature Slightly Below Coagulating Point Until pH Value Becomes 7.0 Preliminary to Drying—Carl H. McCharles and Harry A. Mulvany, Berkeley, Calif. No. 2,087,985. July 27, 1937.

Candies Arranged Into Sales Units by Dropping in Semi-Plastic State Onto a Non-Edible Base to Give Individual Candies a Space Relation to Each Other—Alex W. Paton, South Orange, N. J., to Brewster-Ideal Chocolate Company, Newark, N. J. No. 2,088,247. July 27, 1937.

Individual Pieces of Different Weight Meats Injected With Predetermined Amount of Pickling Brine by Automatically Operated Mechanical Means—George Beisser (deceased) by Charlotte Beisser as Administratrix, Hamburg-Rahlstedt, Germany. No. 2,088,257. July 27, 1937.

A-Maltose and α-Dextrin Mixture for Infant Food Made by Breaking Down Starch with a Mixture of *Aspergillus Oryzae* and Pancreatic Amylase—Günther Malyoth, Munich, Germany to Allgäuer Alpenmilch Aktiengesellschaft, Biessenhofen, Germany. No. 2,088,331. July 27, 1937.

High-Grade Pectin-Containing Material Prepared From Juice-Free Apple Pomace by Heating to From 140 to 200 Deg. F., Cooling to 90 Deg. F., Adding Diastatic Enzyme and Separating Water Soluble Impurities—George L. Baker, Newark, Del., to Public of United States of America. No. 2,088,458. July 27, 1937.

Milk Powder Containing Lactose Hydrate Made by Spray Drying Methods—David D. Peebles, Eureka, and Paul V. Manning, Berkeley Woods, Calif. No. 2,088,606. Aug. 3, 1937.

Belt Conveyor Enclosed so as to be Convertible from Use as Cooling Tunnel Extension to that as Packing Table—Robert P. Rasmussen, Chicago, Ill. Three-eighths to Edvald L. Rasmussen, Washington, D. C. No. 2,088,610. Aug. 3, 1937.